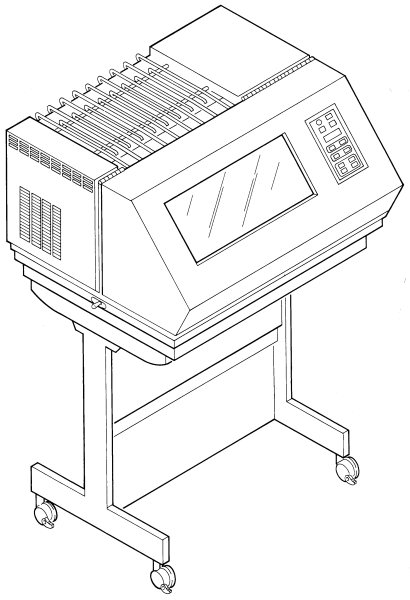
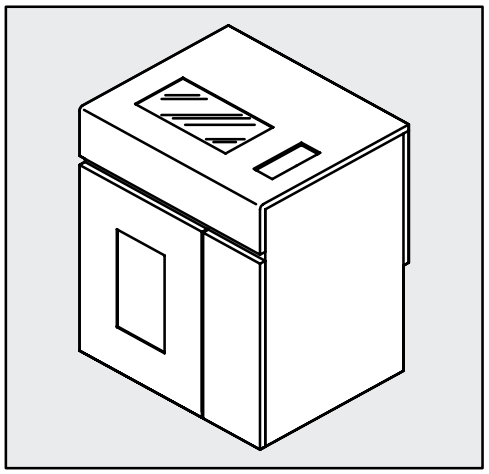
PRINTRONIX®

User's Reference Manual





P600L/P6200L Line Printers

P6000L/P6200L Line Printers
User's Reference Manual

PRINTRONIX®

P/N 140576–001, Rev C

US and CANADA Radio Interference Note

Note: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. The manufacturer is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

The input/output (I/O) cable must be shielded for the printer to comply with FCC rules and regulations Part 15 governing the radiation limits for Class "A" equipment.

This Class A digital apparatus meets all requirements of the Canadian Interference–Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

WARNING

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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ABOUT THIS MANUAL

This manual has been written and formatted in a way to make it easy for you to use. The following is some general information about this User's Reference Manual.

What This Manual Contains

This manual is divided into chapters that contain all the information required to use the printer. Chapters provide introductory information, complete operating information, graphics data, Vertical Format Unit data, programming information, maintenance procedures, interface descriptions, and appendices of supplemental information.

This manual is written for the advanced level systems engineer or experienced programmer who will interface this printer with the host computer or who will prepare software for host computer use to drive the printer. Background information covering fundamental programming concepts is not provided in this documentation.

Warnings, Cautions, and Notes

Additional information requiring special attention is provided under the headings **WARNING, CAUTION, IMPORTANT,** and *NOTE.* WARNINGs provide information about conditions that could lead to injury; CAUTIONs provide information about conditions that could damage the printer; IMPORTANT provides information that should be stressed. *NOTEs*, printed in *italics,* provide supplemental information that could affect printer operation or use.

Switches and Indicators

Throughout this manual, switches, indicators, and possible switch settings or positions are printed in UPPERCASE TYPE. This allows you to easily identify within the text items that are located on the printer.

CHAPTER 1

OVERVIEW

Introduction

The information in this manual applies to both P6000L and P6200L Series printers. The P6000L Series is the pedestal model printer and the P6200L is the floor cabinet model printer. The P6040L and the P6240L are 400 line per minute printers; the P6080L and P6280L are 800 line per minute printers. All models will be identified throughout as P6000L/P6200L Series or simply the printer, unless specifically noted otherwise.

The *Printronix* P6000L/P6200L Series printers are quiet, full−featured, multifunction line printers. Along with the basic P−Series functions, the P6000L/P6200L include Correspondence quality print for Near Letter Quality (NLQ) printing requirements, high speed printing, and character−by−character attributes (Dynamic Character Generation) for wider application compatibility.

This chapter presents an overview of the printer:

- Features
- Optional Features
- Character Formation
- Dot Matrix Line Printing
- Print Rate
- Plot Rate

Refer to the Installation chapter for information on power and site requirements, and printer installation.

Features

P6000L/P6200L Series printers provide the following standard features:

- Quiet Operation
  - The floor cabinet models feature extra quiet operation
- P−Series and Serial Matrix (IBM® Graphic Printer) emulation protocols
- P−Series Plot and Bit Image Graphics
- Dynamic Character Generation
  - Selectable pitch
  - Elongated print
  - Shadow print
  - Expanded print

- Automatic underline
- Automatic overscore
- Superscript printing
- Subscript printing

- Selectable Forms Length
- Electronic Vertical Formatting
  - Standard *Printronix* electronic vertical format unit (EVFU)
  - 12 channel direct access vertical format unit (DAVFU)
- Resident International Character Sets
- RibbonMinder™ ribbon life monitor
- Built−in Self−Test and Diagnostics
- Configuration Printout
- Data Stream Hex Code Printout
- Resident Serial and Parallel Interfaces

Two separate graphics capabilities have been included in the printer: standard P−Series odd−even dot Plot Mode graphics and Bit Image graphics standard on *Printronix* MVP, P3000, and P9000 Series printers and many other serial matrix printers. Intelligent graphics capabilities are available by using the *Printronix* IGP−10 option.

Serial matrix compatibility makes the printer emulate the most common style of printer for personal computers, but at much higher speeds. The user may select industry standard Printronix P−Series or Serial Matrix compatibility from the control panel.

The programmable Vertical Format Unit provides rapid paper advance to specified lines for printing repetitive and continuous forms. When P−Series compatible protocol is used, either the P−Series compatible EVFU (Electronic Vertical Format Unit) or Dataproducts compatible DAVFU (Direct Access Vertical Format Unit) may be selected. In the Serial Matrix protocol, an 8 channel serial vertical format unit is available.

Optional Features

P6000L/P6200L Series printer capabilities and versatility can be enhanced by the following options. For more information, contact an authorized *Printronix* representative.

- **Intelligent Graphics Processor (IGP™)** − Allows the user to create and store forms, generate logos, bar codes, expanded characters, and other graphics. Forms can be created with a variety of graphic components and overlayed with alphanumeric and bar code data in a single pass. The IGP may be ordered with either Printronix graphic commands or QMS® protocol compatibility. Available as a field installable option.
- **IBM Interfaces** − Includes PI−5225 (Twinax) and PI−3287 (Coax) protocol converters to provide compatibility to IBM mainframe and mid−range computers. Available as a field installable option.
- **Character Set Options** − Accommodates various printable symbol or special character set requirements with field installable and changed socket mounted PROMs. All the standard *Printronix* character sets for the P−Series printers are available for the printer. Additionally, custom character sets can be ordered.

- **240 vac Conversion Kit** − Changes the printer power source requirement from 120 vac to 240 vac. Available as a field installable option.
- **Quick Access Configuration** − This optional cabinet and down tractors for pedestal model printers allows easy access to labels and forms without lifting the front cover.
- **Pedestal** − A stand designed for the printer. The pedestal includes locking casters, bottom feed paper path and accepts the optional paper stacker. Available as a field installable option.
- **Quietized Enclosed Pedestal** − A stand for the pedestal models with an enclosure for supply paper and reduced acoustical rating. Includes locking casters, bottom feed paper path, and accepts optional paper stacker. Available as a field installable option.
- **Paper Stacker** − is provided for use with the pedestal model printers. Collects and properly stacks the printed output. Can be used with the optional pedestal and acts as a caddy to transport the paper. Available as a field installable option.

Character Formation

The P6000L/P6200L Series printers generate characters by assembling groups of dots in matrices. Dots are overlapped to produce a solid appearing character of uniform density as shown in Figure 1−1. Dot impressions are made by a row of hammers installed on a moving shuttle. The 400 lines per minute models have 44 hammers mounted on the shuttle; the 800 lines per minute models have 66 hammers. The hammers impact the paper through a moving ink ribbon. Horizontal shuttle movement and vertical paper advancement combine for precise dot printing to form the character matrix.

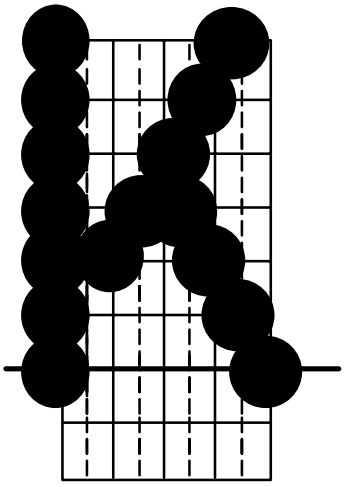


Figure 1−1. Typical Character Formation

Dot Matrix Line Printing

Unlike single head dot matrix printing, the *Printronix* P6000L/P6200L Series creates graphics and characters by printing an entire dot row at one time. As shown in Figure 1−2, dots are printed in both directions of shuttle travel. In the 400 line per minute printers, the shuttle sweeps through three tenths (3/10) of an inch. In the 800 line per minute printers, the shuttle sweeps through two tenths (2/10) of an inch. Paper is advanced as the shuttle reverses direction and the next row of dots is printed.

During each sweep of the shuttle, hammers are activated to print dots at selected positions in a single dot row. When the shuttle reaches the end of a sweep, it reverses direction, paper advances one dot row, and the hammers print the next row of dots.

After an entire line of characters is printed, hammer activity ceases and the paper advances to the first dot row of the next print line. This creates a series of blank rows between lines of characters. The number of rows allowed for line separation depends on the line spacing selected. Line spacing may be selected from the control panel or the host computer.

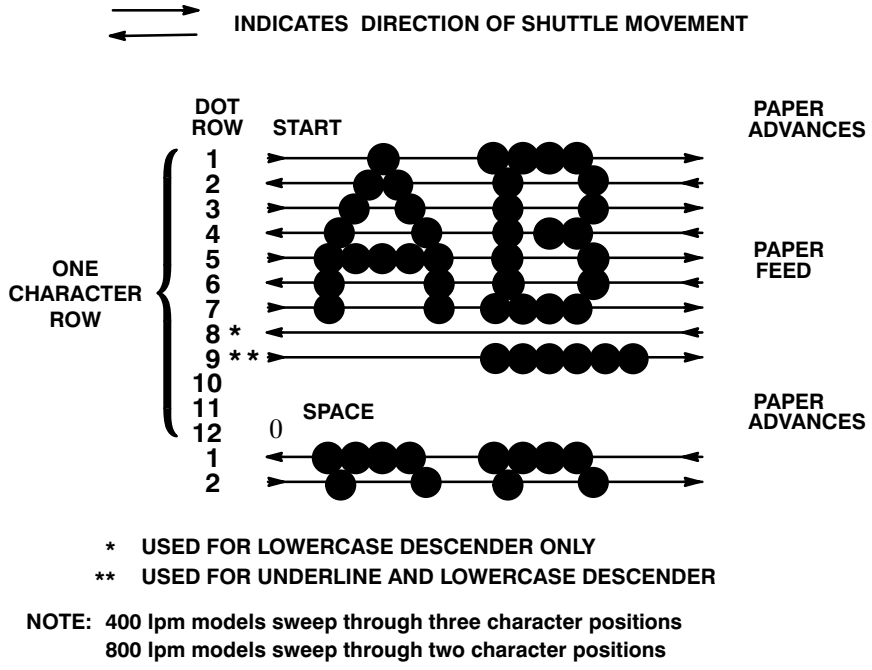


Figure 1−2. Dot Matrix Line Printing

Print Rate

The print rate, in lines per minute (lpm), is a function of the number of dot rows required to produce the character line regardless of the number of characters in the line. For example, more dot rows are required to print lowercase characters with descenders and consequently, those characters are printed at a slower rate. Table 1−1 describes the print rate according to type of character printed and print mode. Complete printing specifications are provided in the Appendix.

Table 1−1. Print Rate

PRINT MODE	PRINT RATE (lpm)			
	UPPERCASE ONLY		UPPER/LOWERCASE	
	P6040L/P6240L	P6080L/P6280L	P6040L/P6240L	P6080L/P6280L
Correspondence	89	177	77	154
Data Processing	300	600	240	480
High Speed	400	800	342	685

Plot Rate

As well as character printing, the printer is capable of dot addressable graphic plotting. Based on the protocol selected, either P−Series Plot Mode or Serial Matrix Bit Image Graphics is used; the plot rate specifications apply to both P−Series and Serial Matrix types of graphic plotting. The plot rate (in inches per minute, ipm) is described in Table 1−2 according to the dot density (in dots per inch, dpi). Complete plotting specifications are provided in Appendix C.

Table 1−2. Plot Rate

DENSITY (dpi)	PLOT RATE (ipm)		PLOT RATE (ipm) Unidirectional	
	P6040L/ P6240L	P6080L/ P6280L	P6040L/ P6240L	P6080L/ P6280L
60 Horz x 144 Vert (NLQ mode)	16.8	33.6	8.4	16.8
60 Horz x 72 Vert (DP mode)	33	66	16.6	33
60 Horz x 48 Vert (High Speed)	50	100	25	50

CHAPTER 2

OPERATION

Introduction

This chapter describes basic P6000L/P6200L Series controls and operating procedures. Operation information and cleaning practices are also provided in the Operator's Guide. Refer to the Installation chapter for information on power and site requirements, and printer installation.

P6000L/P6200L Series printers function either online or offline. When online, the printer is capable of receiving data and control commands from the host computer. The message display indicates the printer is online and the current print mode. When offline, communication is suspended between the printer and the host computer and the message OFFLINE READY appears on the display. Set the printer offline to perform the following tasks:

- Select Configuration Values
- Configure the Printer
- Run the Self−Test
- Set Top−of−Form
- Perform a Hex Dump
- Set Line Spacing
- Load Paper and Ribbon
- Advance Forms
- Change Print Modes
- Adjust Paper Tractors
- Advance Paper
- Cleaning/Routine Maintenance

P6000L/P6200L Series printers respond to two different command sets or protocol modes:

- P−Series emulation mode
- Serial Matrix emulation mode

The selected protocol determines which programming standard is used by the host computer to communicate with the printer. Either protocol can be selected as required by the application. The P−Series emulation mode generates characters and graphics by using *Printronix* standard P−Series control code protocol. The Serial Matrix emulation mode allows printing of characters and graphics utilizing control codes similar to many serial matrix printers used with personal computers. The command protocol is selected via the P6000L/P6200L Series application menu in the control panel. Refer to the Programming chapter for detailed information on P−Series and Serial Matrix protocols and control code definitions.

There are two basic modes of operation: character printing (alphanumeric text) and graphics. Character printing is the default mode of operation; graphics, either Serial Matrix compatible

Bit Image graphics or P−Series compatible Plot Mode, is programmed on a line−by−line basis.

This chapter will discuss the following procedures:

- Power Switch
- Lock/Unlock Function Switches
- Control Panel
- Paper Adjustment Controls
- Loading Paper
- Unloading Paper
- Setting Top−of−Form
- Paper Stacking − Floor Cabinet Models
- Selecting Print Mode
- Setting Forms Length
- Loading the Ribbon
- Setting Line Spacing
- Hex Code Printout
- Printer Reset
- Running the Self−Test

For information on the RibbonMinder feature, refer to the RibbonMinder chapter.

Power Switch

The printer must be connected to the proper power source, 120/240 V 50/60 Hz, as shown on the rear panel label. Applying an incorrect power source will damage the printer. Complete power requirement information is provided in the Installation chapter.

On floor cabinet models, the printer ac power switch is located on the lower left corner of the rear panel as shown in Figure 2−1. On pedestal models, the printer ac power switch is located on the lower left side panel as shown in Figure 2−2. To turn the printer power on, set the power switch to the ON position.

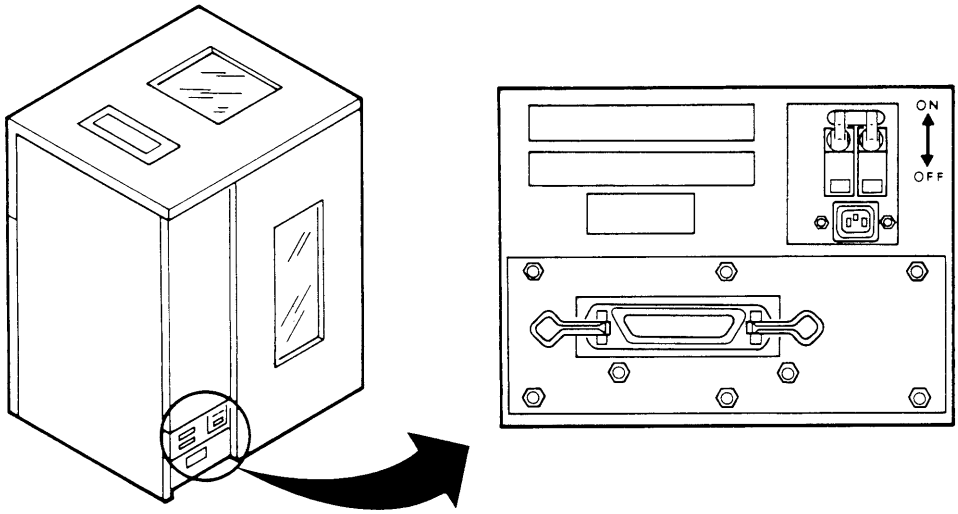


Figure 2−1. Power Switch − Floor Cabinet Model

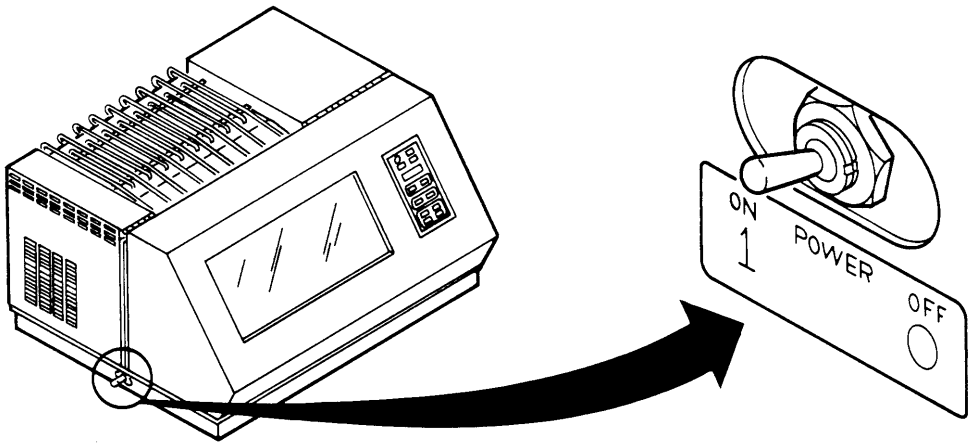


Figure 2−2. Power Switch − Pedestal Model

Locking/Unlocking Printer Configuration

To prevent accidental reconfiguration, the printer configuration (the parameter settings of the printer) is normally locked. Before any new parameter settings are selected through the use of the RUN/STOP TEST switch, the printer configuration must be unlocked. Simultaneously pressing RUN/STOP TEST and CONFIG MENU, while the printer is OFFLINE READY, alternately unlocks and locks the printer configuration. Resetting the printer or turning the power off and on will also lock the printer configuration.

NOTE: While DATA IN BUFFER is present, the printer configuration will remain locked. Press PAPER ADVANCE, TOP−OF−FORM, or ONLINE to empty the printer's buffers and remove the DATA IN BUFFER condition.

Control Panel

The printer control panel contains eleven switches, a power−on indicator, and a 32 character alphanumeric Message Display as shown in Figure 2−3. Each switch is described on the following pages.

Power Indicator − This indicator lights when the ac POWER switch is ON. On floor cabinet models, the POWER switch is located on the lower left corner of the rear panel. On pedestal models, the POWER switch is located on the bottom left side of the printer.

ON LINE − Press this switch once to place the printer online or offline. The printer must be online to print. When online, the display will indicate the current print mode and none of the other control panel switches will function. When offline, the display will indicate OFFLINE READY and the printer cannot communicate with the host computer. The printer will go offline automatically when a malfunction occurs and must be offline to change printing format or configuration.

PAPER ADVANCE − Momentarily press this switch to advance the paper one line or press and hold the switch to advance the paper continuously. This switch functions only when the printer is offline.

TOP OF FORM − Press this switch once to advance one forms length (one page) to the top of the next form. This switch functions only when the printer is offline.

CONTROL PANEL

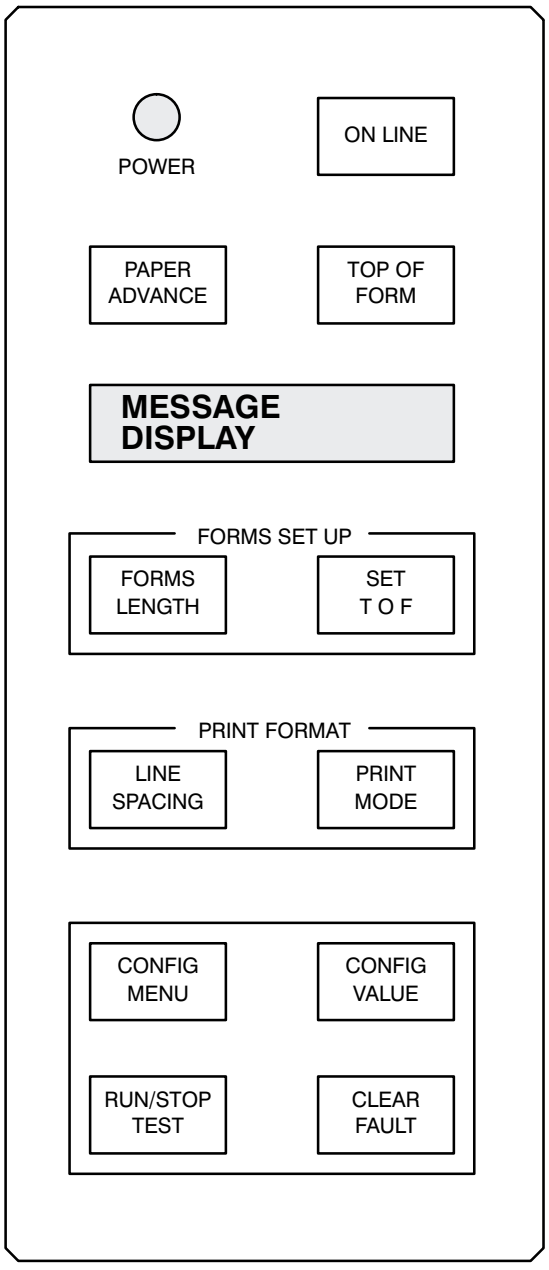


Figure 2−3. Control Panel

PRINT MODE − Press this switch to display the current print mode. Subsequently pressing this switch changes the print mode and updates the display through all of the available print modes listed below. Each print mode has a variety of pitch selections ranging from 10 to 17 characters per inch (cpi). Print mode is a line−by−line attribute; different print modes (and related pitch) can be used for different lines of the form but you cannot mix print modes on one

individual line. This switch functions only when the printer is offline. The printer configuration must be unlocked to select a new print mode.

Data Processing (DP) at 10, 12, 13, 15, and 17 cpi.

Correspondence (NLQ) at 10, 12, 13, 15, and 17 cpi.

High Speed at 10, 12, and 13 cpi.

NOTE: Print mode control from the host computer will override the switch setting. Other pitch and print attributes can be selected using control codes.

Alphanumeric Message Display − The display presents printer status and error condition messages. The display has two rows with sixteen characters per row. During normal operation, the display indicates the online status and the current print mode (and pitch) selection. When offline, the display indicates offline ready.

FORMS LENGTH − Press this switch to display the current forms (page) length. Subsequently pressing the switch changes the form length and updates the display through all possible form length settings from 1.0 to 24.0 inches in 0.5 inch increments. This switch functions only when the printer is offline. The printer configuration must be unlocked to select a new forms length.

NOTE: Forms length control from the host computer will override the switch setting. Using control codes, forms length in increments other than 0.5 inch can be selected.

SET TOF − Press this switch to set the TOF (top−of−form) position. If this switch is pressed when the paper is not properly positioned for the required top−of−form, normal operation and top−of−form function can be affected. Refer to the Setting Top−of−Form section for complete instructions. This switch functions only when the printer is offline.

LINE SPACING − Press this switch to display the current line spacing in lines per inch (lpi). Subsequently pressing this switch changes the line spacing and updates the display through all line spacing settings (6 and 8 lpi). Line spacing is a line−by−line attribute; different line spacing can be used for different lines of the form but you cannot mix line spacing on one individual line. This switch functions only when the printer is offline.The printer configuration does not have to be unlocked to change this setting.

NOTE: Line spacing control from the host computer will override the switch setting. Control codes from the host computer can select line spacing other than the 6 or 8 lpi.

CONFIGURATION MENU − Configuration Menu (CONFIG MENU) is used to display/select configuration parameter main menus and certain submenus. Pressing CONFIG MENU simultaneously with RUN/STOP TEST alternately locks and unlocks the printer configuration (the printer must be offline). Repeatedly pressing CONFIG MENU displays the following menus:

- Ribbon Life
- Character Set
- Application Compatibility
- Paper Format
- Host Interface
- Load Parameters
- Save Parameters

- Diagnostics

After the required menu is displayed, individual parameters are displayed using the CONFIG VALUE switch as shown on the Control Panel Switch Function Diagram in the Configuration chapter.

CONFIGURATION VALUE – Press Configuration Value (CONFIG VALUE) to display individual configuration parameters and the current value from within the main menus.

NOTE: Alternately and/or repeatedly pressing CONFIG MENU and CONFIG VALUE allows the display of the configuration parameters as shown on the Control Panel Switch Function Diagram in the Configuration chapter. The CONFIG MENU and CONFIG VALUE switches when pressed simultaneously step backward through the configuration menu, forms length, and print mode selections.

RUN/STOP TEST – The RUN/STOP TEST switch performs the following functions:

- Press RUN/STOP TEST simultaneously with CONFIG MENU to alternately unlock and lock the printer configuration..
- Press RUN/STOP TEST to select a configuration parameter, forms length, or print mode. An asterisk (*) will appear to the right of the value to indicate that it has been selected.
- Press RUN/STOP TEST simultaneously with CLEAR FAULT to reset the printer.
- If a self−test is selected and shown on the display, press RUN/STOP TEST to start the test and press it again to stop the test.
- If the CONFIGURATION PRINTOUT message is selected and shown on the display, press RUN/STOP TEST to print a list of the current configuration. Press RUN/STOP TEST again to return to OFFLINE READY.

CLEAR FAULT – Press this switch to reset the printer after a fault condition has been corrected. Fault conditions are indicated on the display. After pressing CLEAR FAULT the display will indicate the printer is offline if the fault was corrected.

In addition, the CLEAR FAULT switch performs two special functions:

- Press CLEAR FAULT simultaneously with RUN/STOP TEST to reset the printer.
- Press CLEAR FAULT when one of the parameter values is displayed to move up one menu parameter selection or to offline. Refer to the Control Panel Switch Function Diagram in the Configuration chapter.

Paper Adjustment Controls

The printer paper loading controls for the floor cabinet model are shown in Figure 2−4. The printer paper loading controls for the pedestal model are shown in Figure 2−5. The controls are the Forms Thickness Adjustment Lever (A), the Vertical Position Knob (B), the Horizontal Adjustment Knob (C), and the paper tractors (D). The PAPER ADVANCE switch on the control panel is also used during the paper loading procedure.

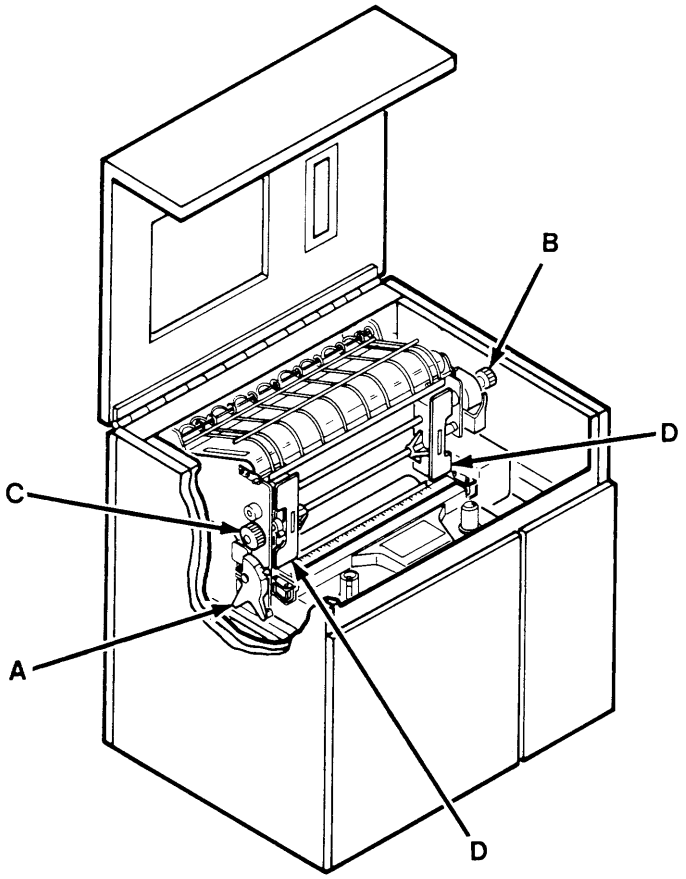


Figure 2−4. Paper Adjustment Controls − Floor Cabinet Model

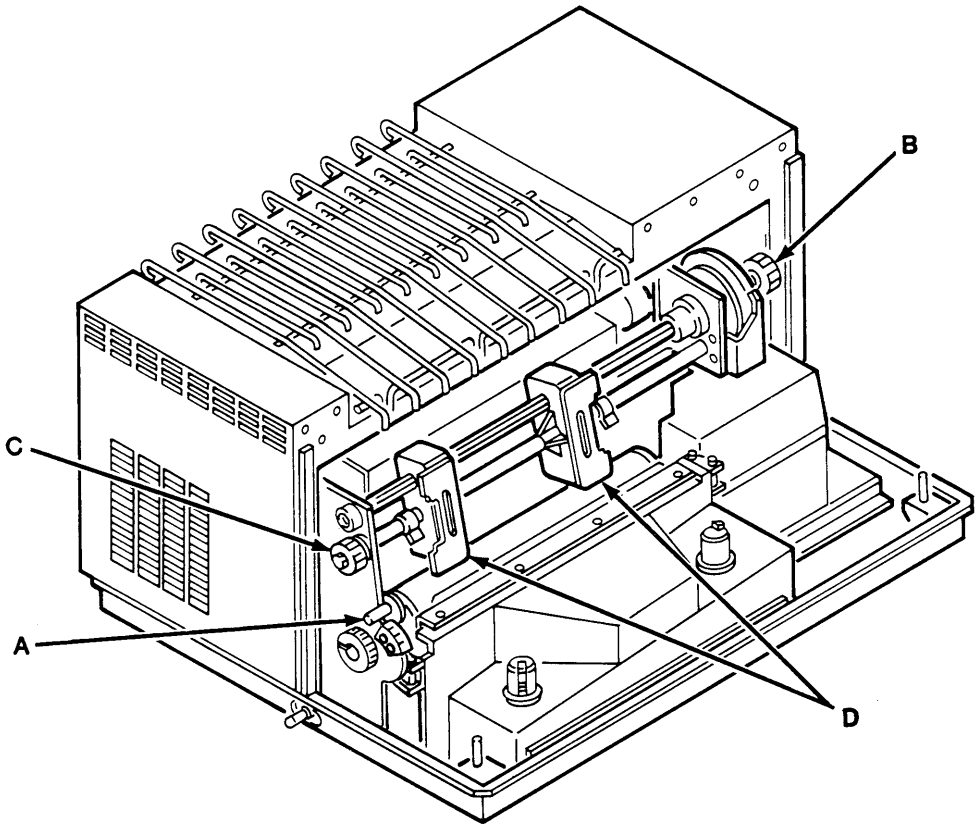


Figure 2−5. Paper Adjustment Controls − Pedestal Model

Forms Thickness Adjustment Lever − The Forms Thickness Adjustment Lever, shown in Figure 2−6, controls the platen gap. Raising the lever opens the platen and lowering the lever closes the platen to adjust for various paper thicknesses. The scale indicates approximate positioning to correspond with paper thickness (1 to 6 part forms). Generally, set the lever for a slight friction on the paper as it moves past the hammer bank. If the Forms Thickness Adjustment Lever is set incorrectly, the print hammer flight timing can be upset, resulting in waviness of vertical lines (called poor phasing). When fully raised, the platen is open to allow paper loading and ribbon replacement; a platen open message is shown on the display. After lowering the lever to the appropriate operating position, press CLEAR FAULT on the Control Panel to clear the platen open condition.

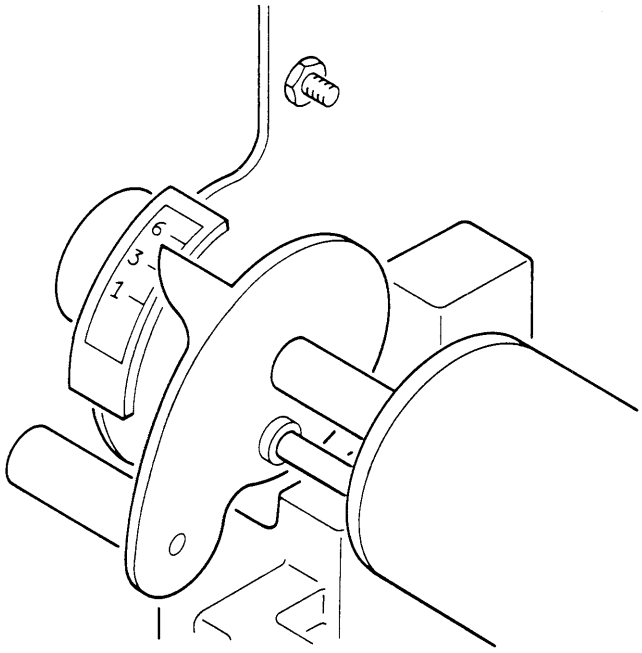


Figure 2−6. Forms Thickness Adjustment Lever

Vertical Position Knob − The Vertical Position Knob, shown in Figure 2−7, moves the paper up or down. The platen must be open (Forms Thickness Adjustment Lever fully raised) to use this control.

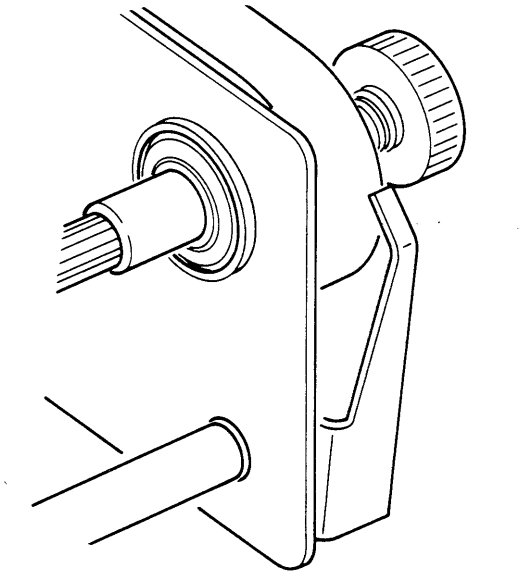


Figure 2−7. Vertical Position Knob

Horizontal Adjustment Knob − The Horizontal Adjustment Knob, shown in Figure 2−8, shifts the paper left or right up to approximately 1/3 inch. This control is used to make fine adjustments to the left margin. Once adjusted, further adjustments are usually not required.

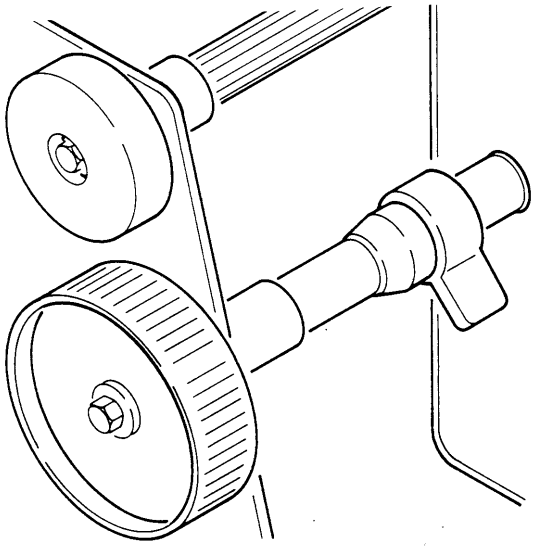


Figure 2−8. Horizontal Adjustment Knob

Tractors − The paper tractors feed the paper through the printer. The position of the left tractor, shown in Figure 2−9, establishes the left paper margin. Normally, the left tractor is positioned for the left print margin (first character position) to align with character column 1 on the paper scale (on top of the ribbon deck cover). Once properly positioned, further adjustments are not required unless a change is made to the left print margin. Margins can also be established by control codes from the host computer. Refer to the Programming chapter. The right tractor position is adjusted to compensate for various paper widths. Both tractors are locked in position during normal operation and must be unlocked to make any position adjustment. To unlock the tractor, simply raise or lower the tractor lock to the center position and slide the tractor as necessary. If the tractor has screw−type locks, simply rotate the knobs to lock/unlock the tractor. Once in position, be sure to lock the tractor again.

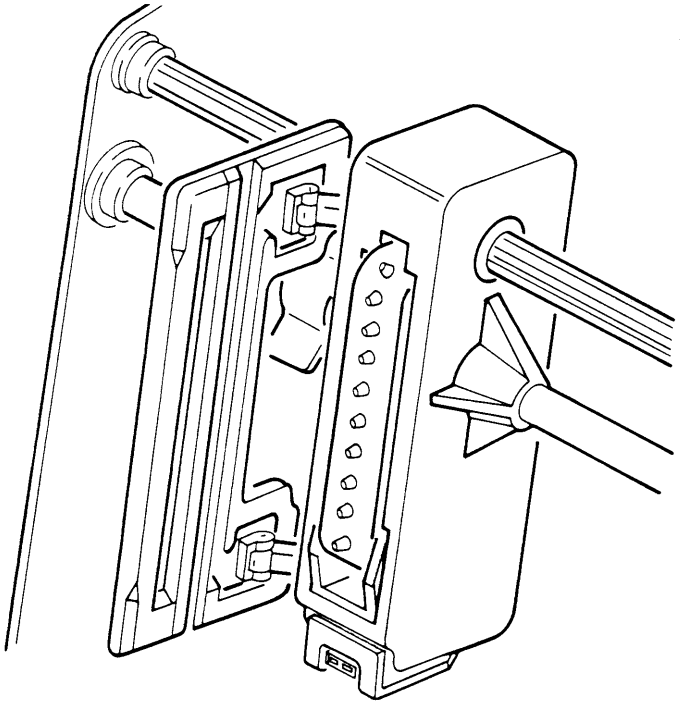


Figure 2−9. Left Paper Tractor

Loading Paper

P6000L/P6200L Series printers use standard fanfold paper from 3 to 16 inches wide and 15 to 100 lb bond (0.025 inches thick maximum). To load paper, perform the following steps and refer to Figure 2−10.

1. Place the printer offline and raise the top cover.
2. Fully raise the Forms Thickness Adjustment Lever (A).
3. Open both tractor gates (B) by swinging them out.
4. On floor cabinet models, open the front cover and feed the paper up through the paper slot (C) from below. On pedestal models, feed the paper up through the paper slot (C) in the pedestal or table from below. On both models, push the paper up until it appears above the ribbon mask (D). If the paper snags, fold the top edge down before feeding.
5. Load the paper on the tractor sprockets (E); close the tractor gates (B). If necessary to slide the right tractor to remove paper slack or to adjust for various paper widths, release the right tractor lock (F) by raising or lowering it to the center; slide the tractor into position. After positioning the tractor, lock it in place.

   NOTE: The left tractor should remain locked in alignment with the number "1" on the paper scale to set the left margin with the first character space.

6. Press TOP OF FORM or PAPER ADVANCE to further advance paper into the paper stacking area. Verify unobstructed paper feeding.

7. Set the Forms Thickness Adjustment Lever (A) to approximate the paper thickness (1 to 6 parts). If closed too tightly, the shuttle may smear or tear the paper.

8. Press CLEAR FAULT and place the printer online.

9. Set the top−of−form as described in the Setting Top−of−Form procedure.

10. Close the printer cover.

11. On floor cabinet models, perform the Paper Stacking instructions to start the paper stacking properly.

Unloading Paper

1. Place the printer offline.

2. Tear off the paper below the paper guide. On pedestal model printers, this will be at the bottom of the printer.

3. Fully raise the Forms Thickness Adjustment Lever.

4. Open both tractor gates and remove the paper from the tractor sprockets.

5. Gently pull the paper up through the paper slot. Be careful not to let paper perforations or sprocket holes catch on the ribbon mask.

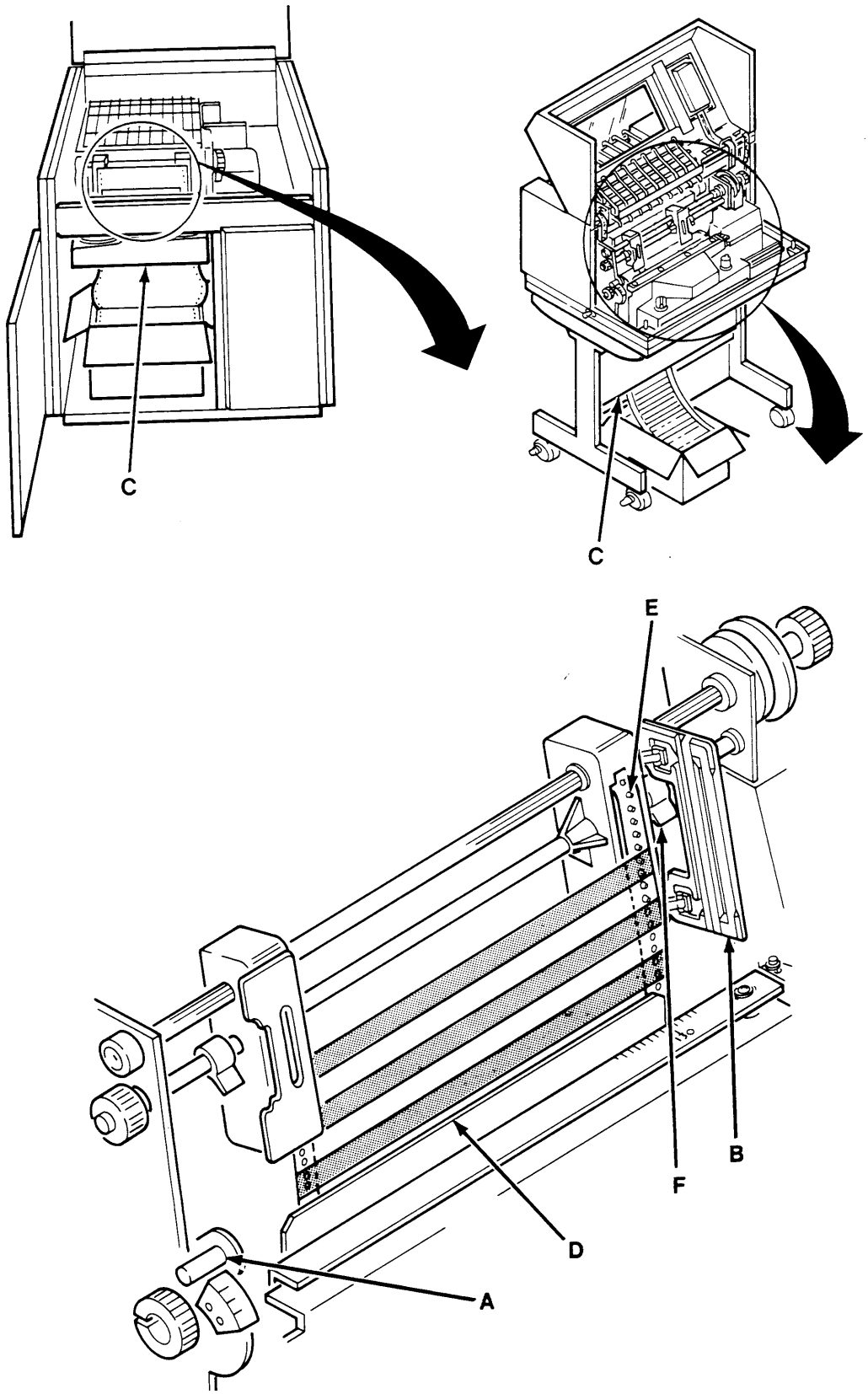


Figure 2−10. Loading Paper

Setting Top−of−Form

Top−of−form determines where the first line of print will appear and should be set when paper is loaded. Generally, set the first line of print about one−half inch below the paper perforation or where application requirements dictate.

After the top−of−form is set, the paper can be advanced to the top of the next form by pressing the TOP OF FORM switch. Unless specifically altered, P6000L/P6200L Series printers assume 11−inch length paper is used. For alternate length forms, refer to the Setting Forms Length section.

Use the following procedure to set the top−of−form.

1. Place the printer offline.
2. Fully raise the Forms Thickness Adjustment Lever (A) to position the top of the first line to be printed at the top of the black TOP−FORM mark on the left tractor gate as shown in Figure 2−11.
3. Set the Forms Thickness Adjustment Lever to approximate the paper thickness (1 to 6 parts). If closed too tightly, the shuttle may smear or tear the paper.
4. Press Clear Fault to clear the PLATEN OPEN condition.
5. Press SET TOF.

   NOTE: Pressing SET TOF at any other time will reset the top−of−form position.
6. Place the printer online.

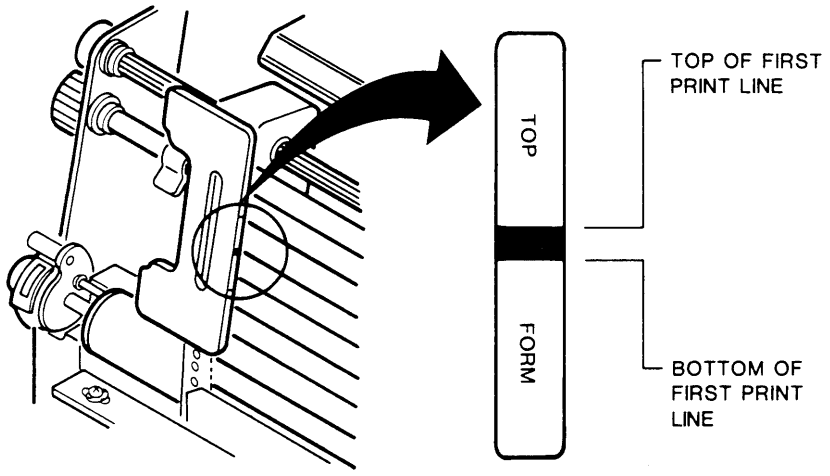


Figure 2−11. Setting Top−Of−Form

Paper Stacking − Floor Cabinet Models

The floor cabinet model is capable of stacking up to one complete box of standard computer paper when the paper is properly loaded. After loading the paper, perform the following instructions.

1. Open the rear cabinet door to access the paper stacking area.

   NOTE: Steps 2 and 3 pertain to installation of the two paper stacking fences, the front fence between the paper stack and the paper supply and the rear fence on the rear cabinet door. If these fences have already been installed, continue with the paper stacking instructions at step 4.

2. If not previously installed, install the front paper fence in the bracket as close as possible to the paper stacking area as shown in Figure 2−12. The bracket is located in the upper portion of the printer paper stacking area near the outer edges. The fence must be installed in the same bracket position on each side to maintain a straight vertical orientation.

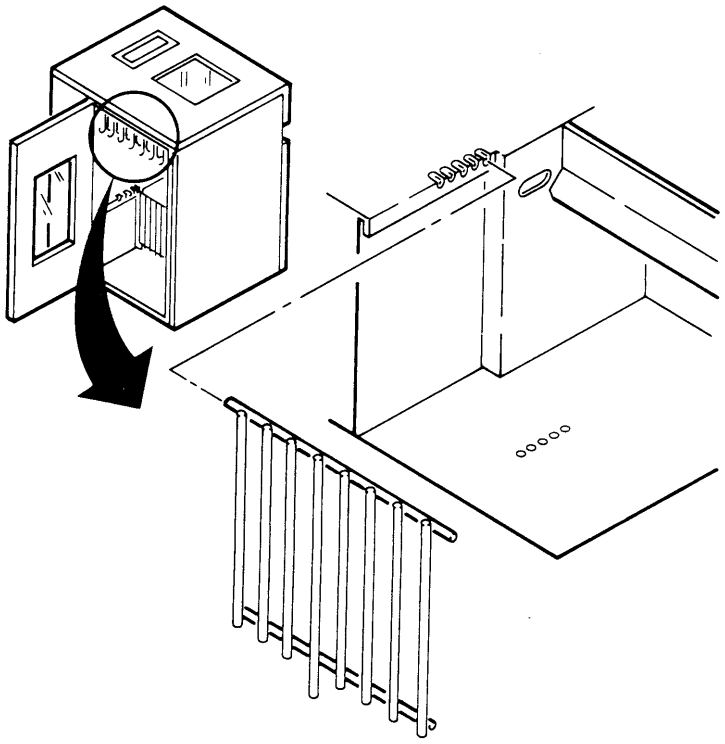


Figure 2−12. Front Paper Fence Installation − Floor Cabinet Models

3. If not previously installed, install the rear paper fence on the inside of the rear cabinet door placing the fence in the brackets at each upper edge of the door and in the bracket centered on the lower edge of the door as shown in Figure 2−13.

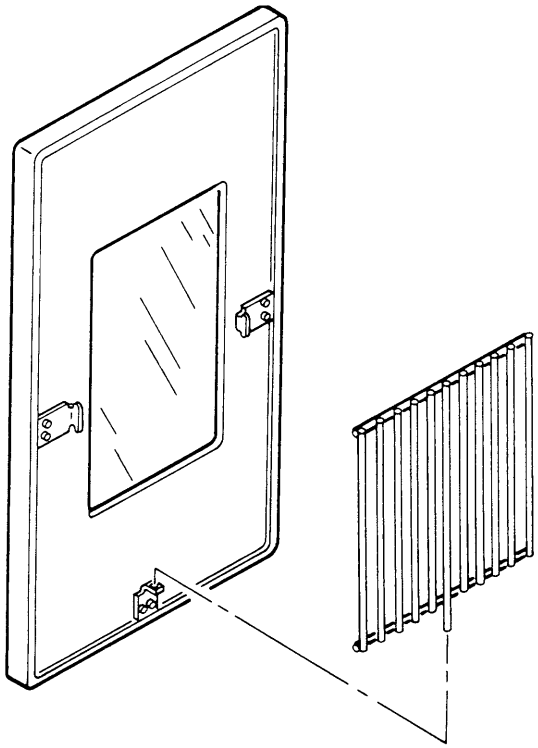


Figure 2−13. Rear Paper Fence Installation − Floor Cabinet Models

4. Install the paper stacking tent into the paper stacking area with the far edge of the tent against the front paper fence as shown in Figure 2−14.

5. Align the outer edges of the tent with the outer edges of the paper supply as seen through the printer cabinet.

6. Advance the paper until a few sheets begin to stack on the tent as shown in Figure 2−15.

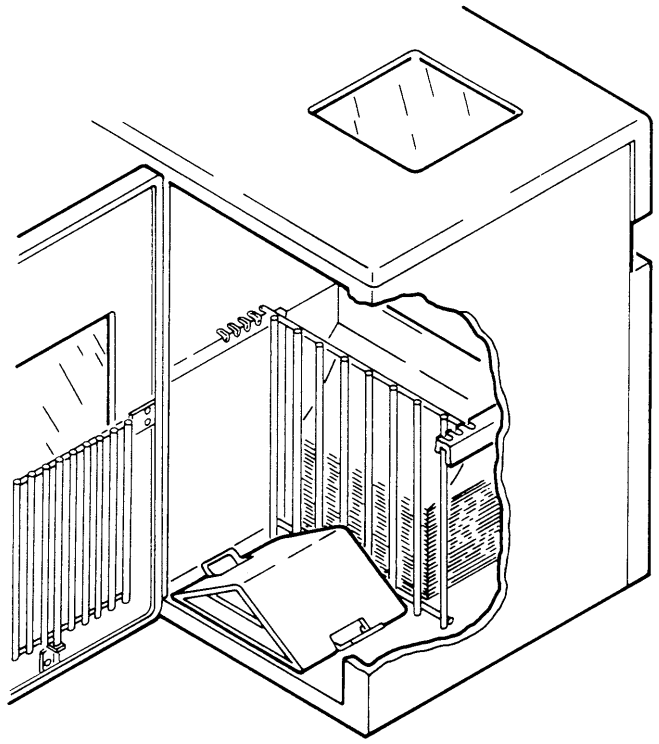


Figure 2−14. Paper Tent Installation − Floor Cabinet Models

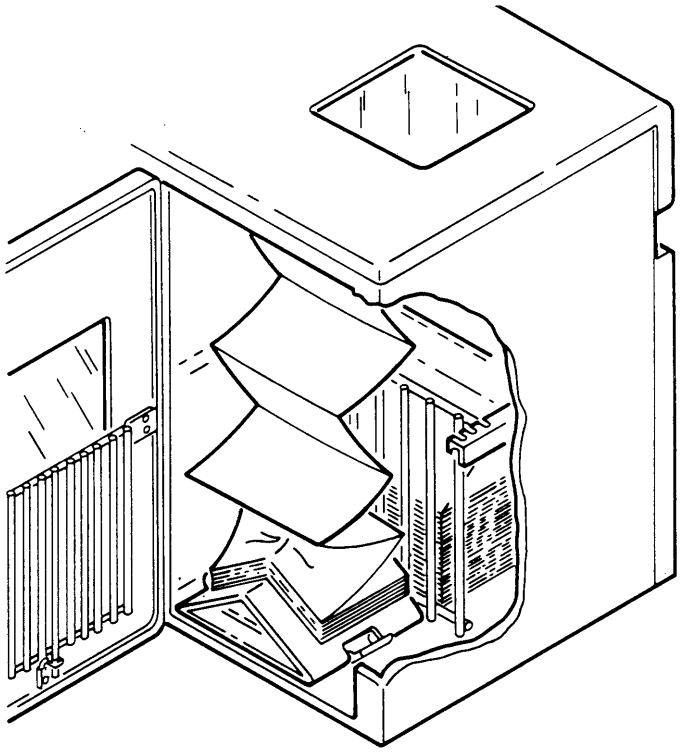


Figure 2−15. Paper Stacking − Floor Cabinet Models

7. Verify the following and make any necessary adjustments.

    a. The paper stack is centered on the tent**.**

    b. The paper perforation folds are folding in their natural prefolded direction.

    c. The paper is following a straight path down to the tent in alignment with the outer edges.

    d. The paper is against the front paper fence as it rests centered on the tent.

8. Run the printer and let approximately 15 to 20 sheets of paper stack.

9. Again verify the items listed in step 7. Any adjustments to the paper stack can be made while the printer is running. If an adjustment is made, again check the stack after approximately 15 to 20 sheets have been processed.

    NOTE: If the paper is not stacking properly, check the following items in addition to those listed in step 7.

    1. *If printing occurs across the paper perforations, the paper will not stack correctly. Adjust the Skip Over Perforation configuration parameter to eliminate printing across the paper perforations.*
    2. *If the paper path is too close to either side panel, paper stacking can be disrupted. Adjust the paper path toward the center of the printer, away from the side panels.*
    3. *The front paper fence may be incorrectly positioned. Reposition the front paper fence into one of the other bracket locations.*

Selecting Print Mode

Characters and symbols are printed based on the print mode selected. During normal operation, the message display indicates the printer is online and the print mode currently selected. For example,

ON LINE

DP AT 10 CPI *

indicates the Data Processing print mode at 10 characters per inch is selected. To select a print mode, perform the following instructions.

1. Place the printer offline.

2. Simultaneously press RUN/STOP TEST and CONFIG MENU to unlock the printer configuration.

3. Press PRINT MODE; the display will show the current print mode.

4. Repeatedly press PRINT MODE until the required print mode is displayed.

5. Press RUN/STOP TEST to select the displayed print mode.

6. Press CLEAR FAULT to return to OFFLINE READY.

7. Simultaneously press RUN/STOP TEST and CONFIG MENU again to lock the printer configuration. Place the printer on line.

Additional printing capabilities and character attributes can be used by sending the appropriate control codes to the printer from the host computer as described in the Programming chapter. Print mode control from the host computer will override the control panel setting.

Loading the Ribbon

Each printer is shipped with an OCR (extra dark) ribbon. The ribbon should be replaced when the print contrast is too light or approximately after each box of standard size computer paper.

To replace the ribbon, perform the following steps and refer to Figure 2−16.

1. Place the printer offline and raise the top cover.
2. Fully raise the Forms Thickness Adjustment Lever (A) to open the platen.
3. Unlatch each ribbon spool (B) and carefully lift them off the hubs (C). Raise the ribbon out of the ribbon path. Properly discard the used ribbon.
4. Place each new ribbon spool (B) on a hub (C) with the ribbon to the outside. The ribbon rewinds automatically; either ribbon spool can be loaded on either hub.
5. Press the spools down until the latch (D) snaps in place.
6. Thread the ribbon around the ribbon guides (E) and through the ribbon path as shown in the diagram (F) on the ribbon deck cover. The ribbon must pass between the two thin metallic strips called the hammer bank cover (G) and the ribbon mask (H).

   NOTE: The ribbon must not be twisted in the ribbon path. A twisted ribbon can lower print quality, shorten ribbon life, or cause a paper jam.
7. Lower the Forms Thickness Adjustment Lever (A) to the appropriate operating position.
8. Press CLEAR FAULT on the control panel to clear the platen open condition.
9. Close the top cover and place the printer online.

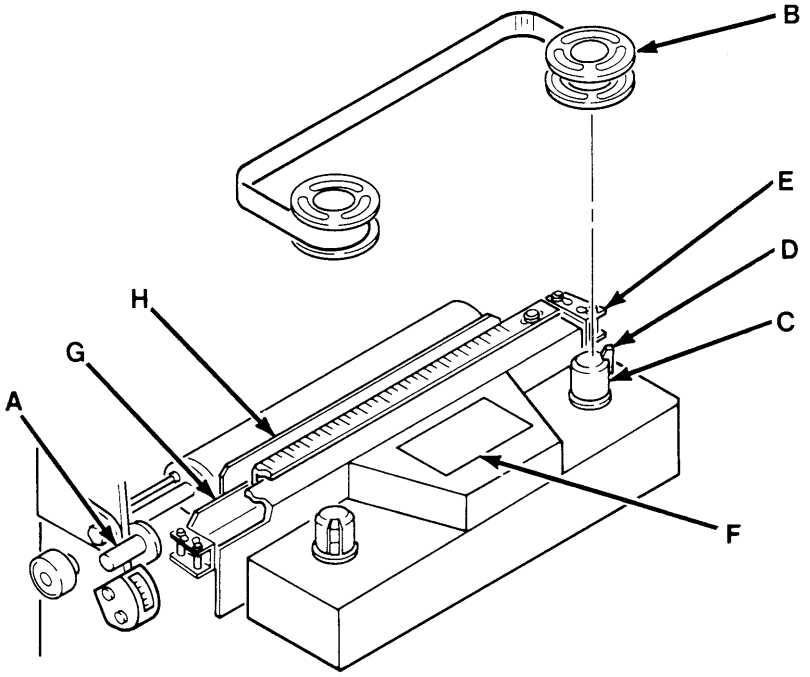


Figure 2−16. Ribbon Replacement

Setting Forms Length

P6000L/P6200L Series printers may use continuous, tractor−fed paper with the forms length set in inches (between 1.0 and 24.0) or lines (between 1 and 192 at 6 or 8 lines per inch). Setting the forms length in lines at 6 or 8 lpi does not change the line spacing. The printer has been preset for standard 11−inch length paper. Therefore, when using alternate length paper, the top−of−form setting and the forms length setting must be changed to match the alternate length. To set the forms length:

1. Place the printer offline.

2. Simultaneously press RUN/STOP TEST and CONFIG MENU to unlock the printer configuration.

3. Press FORMS LENGTH; the display will show the current FORMS LENGTH SET IN INCHES.

4. Continuously pressing FORMS LENGTH will step the display through the following options: FORMS LENGTH SET IN 6 LPI LINES, FORMS LENGTH SET IN 8 LPI LINES, and FORMS LENGTH SET IN INCHES. Choose the appropriate setting, perform the corresponding instructions, and then save the selected forms length.

To set the forms length in inches:

5. Press FORMS LENGTH until FORMS LENGTH SET IN INCHES is displayed.

6. Press CONFIG VALUE to dislay the current forms length in inches.

7. Continue pressing CONFIG VALUE to increment the forms length by 0.5 inch or simultaneously press CONFIG VALUE and CONFIG MENU to decrement the forms length by 0.5 inch. After the appropriate value is displayed, save it as described below.

To set the forms length in lines:

8. Press FORMS LENGTH until FORMS LENGTH SET IN 6 LPI LINES or 8 LPI LINES is displayed.

9. Press CONFIG VALUE to dislay the current forms length in lines.

10. Continue pressing CONFIG VALUE to increment the forms length by 1 line or simultaneously press CONFIG VALUE and CONFIG MENU to decrement the forms length by 1 line. After the appropriate value is displayed, save it as described below.

To save the displayed forms length:

11. Press RUN/STOP TEST to select the displayed forms length.

12. Press CLEAR FAULT to return to OFFLINE READY.

13. Simultaneously press RUN/STOP TEST and CONFIG MENU to lock the printer configuration.

14. Set the top−of−form using the Setting Top−of−Form instructions.

Forms length in inches can also be set by control code from the host computer. Forms length control from the host computer will override the control panel setting.

Setting Line Spacing

P6000L/P6200L Series printers can be set for a line spacing of 6 or 8 lines per inch (lpi) from the control panel using the LINE SPACING switch. To select the line spacing from the control panel, perform the following steps.

1. Place the printer offline.

2. Press LINE SPACING; the display will show the current line spacing.

3. Press LINE SPACING again to display and select the alternate line spacing.

4. Press CLEAR FAULT to return to OFFLINE READY. Place the printer on line.

Line spacing can also be selected by sending line spacing control codes from the host computer. Using control codes, line spacing other than 6 or 8 lpi is available. Line spacing control from the host computer will override the control panel setting.

Hex Code Printout

The hex code printout (called a hex dump) provides a listing of ASCII character data sent from the host with their corresponding two−digit hex code. Nonprintable characters are indicated with a period symbol. A “p” before the hex code indicates an active Paper Instruction (PI) line; a blank space before the hex code indicates an inactive PI line. To print the data stream sent from the host computer in hex code with ASCII character equivalents, perform the following steps.

1. Place the printer offline.
2. Repeatedly press CONFIG MENU until the DIAGNOSTICS message is displayed.
3. Press CONFIG VALUE; CONFIGURATION PRINTOUT will be displayed.
4. Press CONFIG MENU; PRINT DATASTREAM IN HEX CODE will be displayed.
5. Press RUN/STOP TEST; the display will be OFFLINE HEX DUMP.
6. Press ONLINE. The display will indicate ONLINE HEX DUMP.
7. Send the data from the host; the hex dump will print.
8. Press ONLINE again to stop the hex dump. Press RUN/STOP TEST to exit HEX DUMP. Repeatedly press CLEAR FAULT to return to OFFLINE READY.
9. Place the printer online.

Printer Reset

The printer can be reset to the power−up configuration values whenever necessary. To reset the printer, simply press CLEAR FAULT and RUN/STOP TEST simultaneously. The procedure resets the printer to the configuration values last saved, not factory default values.

Running the Self−Test

P6000L/P6200L Series printers include various self−test functions. Use the self−test as needed to determine if the printer is functioning normally.

To run the self−tests:

1. Place the printer offline.
2. Repeatedly press CONFIG MENU until DIAGNOSTICS is displayed.
3. Press CONFIG VALUE; CONFIGURATION PRINTOUT will be displayed.
4. Repeatedly press CONFIG MENU until either PRINTER TEST 8 INCH WIDTH or PRINTER TEST FULL WIDTH is displayed.
5. Repeatedly press CONFIG VALUE until the appropriate test is displayed. Tests include shift recycle, all Es, and others.
6. Press RUN/STOP TEST to begin the selected self−test; press RUN/STOP TEST again to stop the test.

Examine the print quality. The characters should be solidly formed and aligned. If not, there may be a problem with the printer.

7. Repeatedly press CLEAR FAULT to place the printer offline.
8. Place the printer online.

CHAPTER 3
CONFIGURATION

Introduction

Configuration refers to a set of operating parameters that define how the printer will respond to commands sent from the host computer. Most all the configuration parameters are selected from the control panel as shown on the Control Panel Switch Function Diagrams. A few configuration parameters are hardware selectable by jumpers on the Logic C board as described in the Hardware Jumper Configuration section.

Before reconfiguring any printer function, be sure to read this entire chapter. The following information is presented:

- Lock/Unlock Printer Configuration
- Configuration Menus
- Configuration Procedure
- Set/Save/Load Configuration Values
- Default Configuration Values
- Configuration Printout
- Hardware Jumper Configuration
- Control Panel Switch Function Diagram

Locking/Unlocking Printer Configuration

As previously described in the Operation chapter, the printer configuration is locked to prevent accidental or unintentional reconfiguration. Pressing the RUN/STOP TEST and CONFIG MENU switches simultaneously will alternately unlock or lock the printer configuration. The Printer configuration must be unlocked to reconfigure the printer from the control panel.

NOTE: While DATA IN BUFFER is present, the printer configuration will remain locked. Press PAPER ADVANCE, TOP−OF−FORM, or ONLINE to empty the printer's buffers and remove the DATA IN BUFFER condition.

Configuration Menus

The CONFIG MENU switch accesses and displays the various control panel selectable configuration menus. The individual parameter values within each menu are displayed by repeatedly pressing the CONFIG VALUE switch. The following configuration menus appear on the message display:

- Ribbon Life

- Character Set
- Application Compatibility
- Paper Format
- Host Interface
- Load Parameters
- Save Parameters
- Diagnostics

From these menus, the related configuration parameter values can be displayed and selected.

Configuration Procedure

Most configuration options can be selected from the control panel. The few hardware selectable configuration options are described in the Hardware Jumper Configuration section. To verify or modify the configuration from the control panel, the printer must be powered up, offline (OFFLINE READY), and the printer configuration unlocked to select parameters in the configuration menus.

Basic configuration procedure requires alternately pressing the CONFIG MENU and CONFIG VALUE switches to arrive at the desired parameter. The use of these switches and an illustration of the configuration menus are described in the Control Panel Switch Function Diagram section of this chapter. Thoroughly review the diagram to understand the configuration menu hierarchy and the control panel switches necessary to access and display individual menus and parameter values.

The following general procedure can be used to reconfigure the printer from the control panel as necessary to meet application requirements. Detailed descriptions are provided following the general procedure.

1. Simultaneously press RUN/STOP TEST and CONFIG MENU to unlock the printer configuration.

2. Obtain a current configuration listing as described in the Configuration Printout section of this chapter.

3. Determine the parameter values that must be changed to meet requirements. Refer to the Control Panel Switch Function Diagram for an illustration of the parameter values and the procedure required to select and display the values.

4. Select and display the required value(s).

5. Enter the value(s) by pressing the RUN/STOP TEST switch.

6. Save the value(s) as the current default (if desired) as described in the Set/Save/Load Configuration Value section of this chapter.

7. Simultaneously press RUN/STOP TEST and CONFIG MENU again to lock the printer configuration.

8. Place the printer online. The selected values are effective.

Set/Save/Load Configuration Values

Configuration values can be stored for temporary use or saved for more permanent use as the power−up default configuration. In addition, current power−up default values can be loaded (restored) for use as needed.

Set Values

Any configuration value can be changed as needed to meet application requirements. In order to change a configuration parameter, the printer configuration must be unlocked. Select the new value of the configuration parameter and press the RUN/STOP TEST switch. An asterisk (*) will appear to the right of the value to indicate its selection.

> *NOTE: This type of change is only temporary. To permanently change a configuration parameter, refer to the Save Values section of this chapter.*

For example, to temporarily change the forms length parameter to 14.0 inches, unlock the printer configuration and select and display a forms length value of 14.0 inches. Press the RUN/STOP TEST switch to enter the value. 14.0 inches will now be used as the forms length parameter.

Values stored in this way are replaced by the power−up default (saved) values when the printer power is turned off and on. If a particular value is only required for a short term, limited application, it can be stored temporarily. If the value is required for more permanent repeated use, it should be saved as a power−up default.

Saved Values

Saved configuration values are the power−up default values. These are the parameters effective when the power is turned on. Until another value set is saved, the *Printronix* default configuration values are effective at the initial power−up after receiving the printer from the factory. The following general procedure can be used to save configuration values. Refer to the Control Panel Switch Function Diagram for an illustration of the control panel switches required to select and display the parameter menus and values.

1. Unlock the printer configuration by simultaneously pressing the RUN/STOP TEST and CONFIG MENU switches.

2. Select the value(s) required as the power−up defaults using the RUN/STOP TEST switch to enter the change(s).

   NOTE: Changing the Printer Compatibility under the Application Compatibility menu affects other parameter value choices, automatically disabling some values and resetting others. It also sets the current paper position as the top of form. Consequently, if the Printer Compatibility configuration parameter is changed, it must be changed before changing any other parameter values. Values changed prior to changing the Printer Compatibility value may be cancelled and not saved with the value set.

3. Select and display SAVE PARAMETERS.

4. Press RUN/STOP TEST. All currently selected values are saved as the power−up default value set.

5. Press CLEAR FAULT once to return to OFFLINE READY.

6. Lock the printer configuration by simultaneously pressing the RUN/STOP TEST and CONFIG MENU switches, and place the printer online.

The saved values remain effective until specifically changed by storing or saving other values. It is important to remember that all currently selected values are saved, not just the specific value most recently changed. Note also that values changed by control code sequences will also be saved. For example, if the print mode is changed by control code and the configuration values are subsequently saved, the print mode change is also saved. However, horizontal tab positions, margin settings, and character attributes such as bold, double high, etc. that can be changed by control code but are not reflected on the display are not saved with the configuration value set.

Load Values

The current power−up default configuration value set can be loaded (restored) as needed. If, for example, a number of configuration values were changed and stored for temporary use, the complete power−up default set can be restored. This provides a convenient method of resetting the printer's configuration to known values. The following general procedure can be used to load (restore) the power−up default values.

1. Unlock the printer configuration by simultaneously pressing the RUN/STOP TEST and CONFIG MENU switches.

2. Select and display LOAD PARAMETERS.

3. Repeatedly press CONFIG VALUE until the LOAD DEFAULT PARAMETERS message is displayed.

4. Press RUN/STOP TEST. The current power−up default values are restored and in effect.

5. Press CLEAR FAULT once to return to OFFLINE READY.

6. Lock the printer configuration and place the printer online.

Default Configuration Values

The printer comes from the factory with a set of *Printronix* default configuration values as listed in Table 3−1. These values are operational when the printer is received from the factory. New values can be selected and stored or saved as necessary for each application.

Table 3−1. Printronix Default Configuration Values

CONFIGURATION PARAMETER	DEFAULT VALUE	CONFIGURATION PARAMETER	DEFAULT VALUE
Forms Length	11.0 Inches	Job Rate	350
Print Mode	DP 10 cpi	Ribbon Size	60
Line Spacing	6 lpi	When Worn Action	Stop Printer
Character Set	ASCII	RibbonMinder Action	Disable
Printer Protocol	P−Series	Printer Select	Disable
Buffer Size	2048 characters	Paper Advance Switch	Print + Paper Advance
Automatic Line Feed	After Full Line	Slew Relative	1 to 16
Define CR Code	CR = CR	Host Interface	Centronics
Define LF Code	LF = CR + LF	Data Polarity	Standard
Uppercase/Lowercase	Upper and Lower	Response Polarity	Standard
Special Function Character	Disable	Data Protocol	XON/XOFF
VFU Select	EVFU	Data Rate	9600
Paper Motion Detector	Enable	Word Length	8 Bits
Power On State	Online	Stop Bit	One
Mod Plot	Disable	Parity	None
Unidirectional Printing	Disable	Bit 8 Function	Font
Perforation Skip	Disable	CD and DSR	Disable
Paper Fault Stop	End of Paper	CTS and DSR	Disable
Data Line 8	Enable	Data Term Ready	Online and BNF
PI Line	Disable	Request to Send	Online and BNF
Fast Busy	Enable	Reverse Channel	Online and BNF

Configuration Printout

The configuration printout lists all of the currently selected configuration parameter values. A sample configuration printout is shown in Figure 3–1.

The following general procedure can be used to obtain a configuration printout. Refer to the Control Panel Switch Function Diagram for an illustration of the switches required to select and display the parameter menus and values.

1. Verify the POWER indicator is lit and the printer is off line.
2. Repeatedly press CONFIG MENU until DIAGNOSTICS is displayed.
3. Press CONFIG VALUE; select and display the CONFIGURATION PRINTOUT menu.
4. Press RUN/STOP TEST. The configuration printout will be produced.
5. Press RUN/STOP TEST again to return to OFFLINE READY.

```
Model number P6X80
Copyright (c) 1988, Printronix Inc.
P6000 Program 2.03 , 24-Feb-89 Part No. 140657
P6000 Font    2.02 , 24-Feb-89 Part No. 140658
Remember to use the Run/Stop key to change printer settings!
   FORM LENGTH SET      AT 11.0 INCHES
   LINE SPACING         SET AT 6 LPI
   PRINT MODE           DP AT 10 CPI
   CHARACTER SET          ASCII

   RIBBON LIFE
        RIBBON SIZE          CURRENT     60
        JOB RATE             CURRENT    350
        WHEN WORN ACTION     STOP PRINTER
        ENABLE/DISABLE       DISABLE ACTION

   PRINT STATISTICS
        POWER ON TIME        00045.6 Hrs
        PRINT TIME           00000.2 Hrs
        SHUTTLE STROKES      0,000,267,928
        PRINT LINES          0,000,018,312
        PRINT PAGES          0,000,000,454

   APPLICATION          COMPATIBILITY
        PRINTER PROTOCOL     P-SERIES
        BUFFER SIZE          2048 CHARACTERS
        UPPERCASE SELECT     UPPER & LOWER
        PRINTER SELECT       DISABLE
        PAPER ADVANCE SW     PRINT + PAP ADV
        POWER ON STATE       ONLINE
        UNIDIRECTIONAL       DISABLE

   PAPER FORMAT
        AUTO LINE FEED       AFTER FULL LINE
        DEFINE CR CODE       CR = CR
        DEFINE LF CODE       LF = CR + LF
        VFU SELECT           EVFU
        PERFORATION SKIP     DISABLE
        PAPER EMPTY          END OF PAPER
        PMD FAULT            ENABLE
        MODIFIED PLOT        DISABLE
        SLEW RELATIVE        1 TO 16

   HOST INTERFACE       CENTRONICS
        DATA BIT 8           ENABLE
        DATA POLARITY        STANDARD
        RESP. POLARITY       STANDARD
        FAST BUSY            ENABLE
        PI LINE              DISABLE
```

Figure 3−1. Sample Configuration Printout

Hardware Jumper Configuration

Jumpers on the Logic C board are used to select a few configuration parameters. These jumpers are installed for normal operation at the factory. However, certain applications may require a modification to the jumper configuration. To change any of these configuration jumpers, the C3 logic board must be removed. Table 3−2 describes the jumper configurations. To access the Logic C PCBA in floor cabinet model printers, the right side panel must be removed and the card cage lowered. The following procedures provide instructions on accessing the Logic C PCBA for both the floor cabinet and pedestal models.

❑ WARNING ❑

Any of these hardware changes require attention to detail on the PCBA assembly to prevent damage. Some configurations require cutting an etch on the PCBA and soldering. These changes should only be performed by a trained technician.

Side Panel Removal − Floor Cabinet Model

To remove the right side panel, perform the following instructions and refer to Figure 3−2.

1. Turn the printer off and disconnect the ac power cord.
2. Raise the printer cover.
3. Disconnect the two ground wire connectors (A) from the corners of the side panel.
4. Loosen the side panel release screw (B) with the Phillips head screwdriver. Do not remove the screw; simply loosen it enough to slide in the notched cutout on the frame.
5. Using both hands, lift the side panel up and out from the bottom edge. The panel fits snugly on four mounting studs (C). First time removal of the side panel may require extra pressure to unseat the studs from the panel keyholes (D). The card cage can now be accessed.

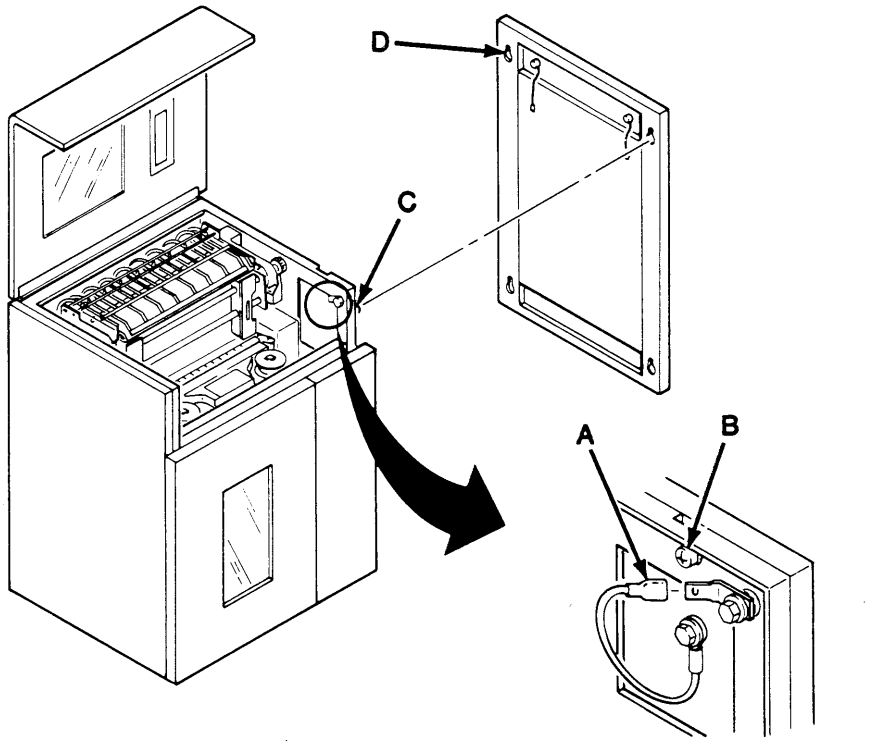


Figure 3−2. Side Panel Removal − Floor Cabinet Model

Removing the PCBA − Floor Cabinet Model

After removing the side panel, the card cage can be accessed. To remove the Logic C PCBA from the card cage, perform the following instructions and refer to Figure 3−3.

1. To lower the card cage (A), loosen but do not remove the release wing nut (B) on the right side of the card cage and gently pull the front edge of the cage down.

2. Locate the Logic C PCBA (C); the names of the PCBAs are printed on the card cage.

3. Cut the tie wrap restraints (D) if present.

4. Snap out the top and bottom ejector levers (E) to release the PCBA from the edge connector.

5. Gently slide the PCBA out of the card cage.

6. Make or verify the required jumper configuration change(s). See Table 3−2 on page 3−13.

7. Align the PCBA with its slot and gently slide it back into the card cage.

8. Press the ejection levers (E) back into position to secure the PCBA into the edge connector. If the PCBA does not go into position with only moderate force, remove the PCBA and realign it in its slot.

❑ **WARNING** ❑

Forcing the PCBA back into position can damage components or break the PCBA. Never force the PCBA into position; always realign and reinstall the PCBA if it cannot be replaced with only moderate force.

9. Raise the card cage (A); secure it by tightening the release wing nut (B).

10. Replace the side panel on the mounting studs.

11. Tighten the side panel release screw.

12. Connect the ground wires to the corners of the side panel.

13. Close the printer cover.

14. Connect the ac power source.

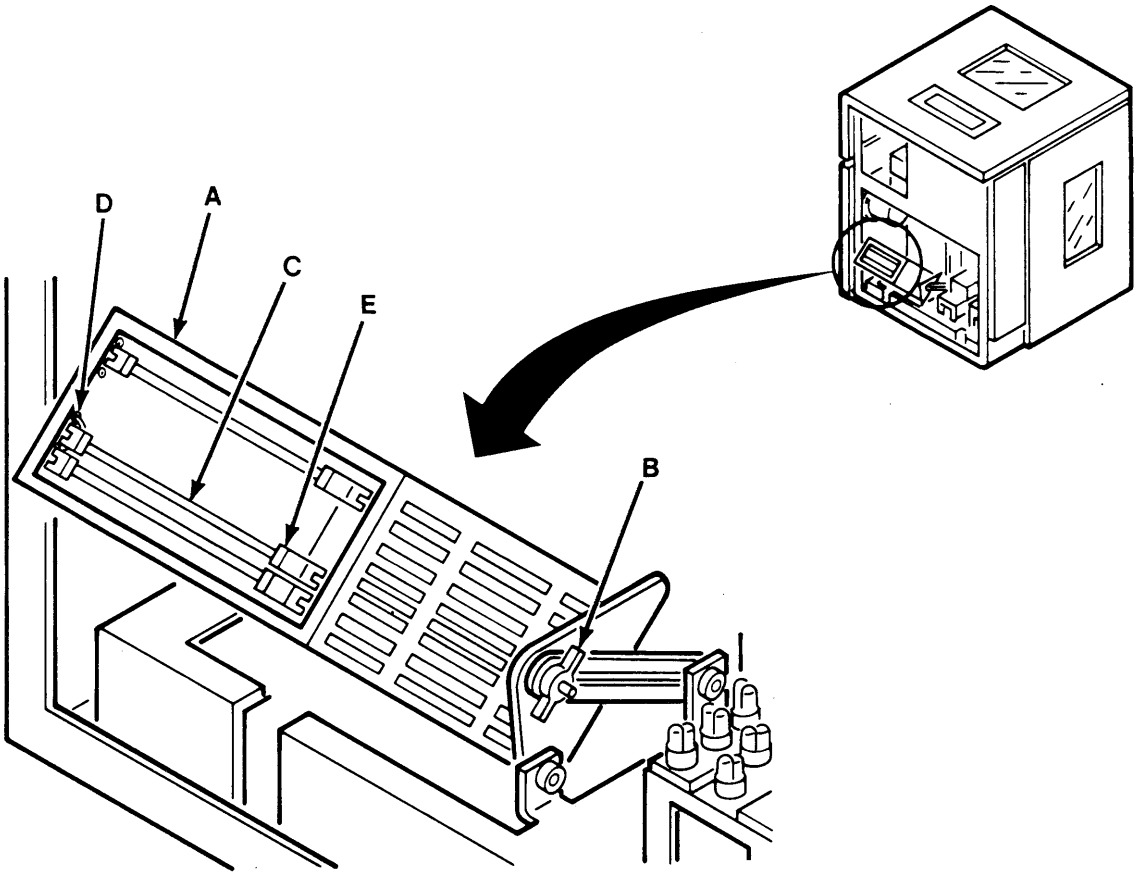


Figure 3−3. PCBA Removal − Floor Cabinet Model Printer

Logic C PCBA Removal and Replacement − Pedestal Model Printer

Perform the following instructions and refer to Figure 3−4 to remove and replace the Logic C PCBA.

1. Turn the printer off and disconnect the ac power cord.
2. Turn the two captive screws (A) at the top of the rear panel to unlock it. Lower the rear panel.
3. Swing the card cage (B) out from the back of the printer.
4. Locate the Logic C PCBA (C); the names of the PCBAs are printed on the card cage.
5. Cut the tie wrap restraints (D) if present.
6. Snap out the top and bottom ejector levers (E) to release the PCBA from the edge connector.
7. Gently slide the PCBA out of the card cage.
8. Make or verify the required jumper configuration change(s). Refer to Table 4−2.
9. Align the PCBA with its slot and gently slide it back into the card cage.
10. Press the ejection levers (E) back into position to secure the PCBA into the edge connector. If the PCBA does not go into position with only moderate force, remove the PCBA and realign it in its slot.

❑ **WARNING** ❑

Forcing the PCBA back into position can cause damage to the components or break the PCBA. Never force the PCBA back into position; always try to realign and reinstall the PCBA if a large amount of pressure must be exerted.

11. Swing the card cage (B) back into the printer.

    NOTE: It is not necessary to replace the tie wrap restraints on the ejector levers.

12. Raise the rear panel and secure it with the two screws.
13. Reconnect the ac power cord and turn the printer on.

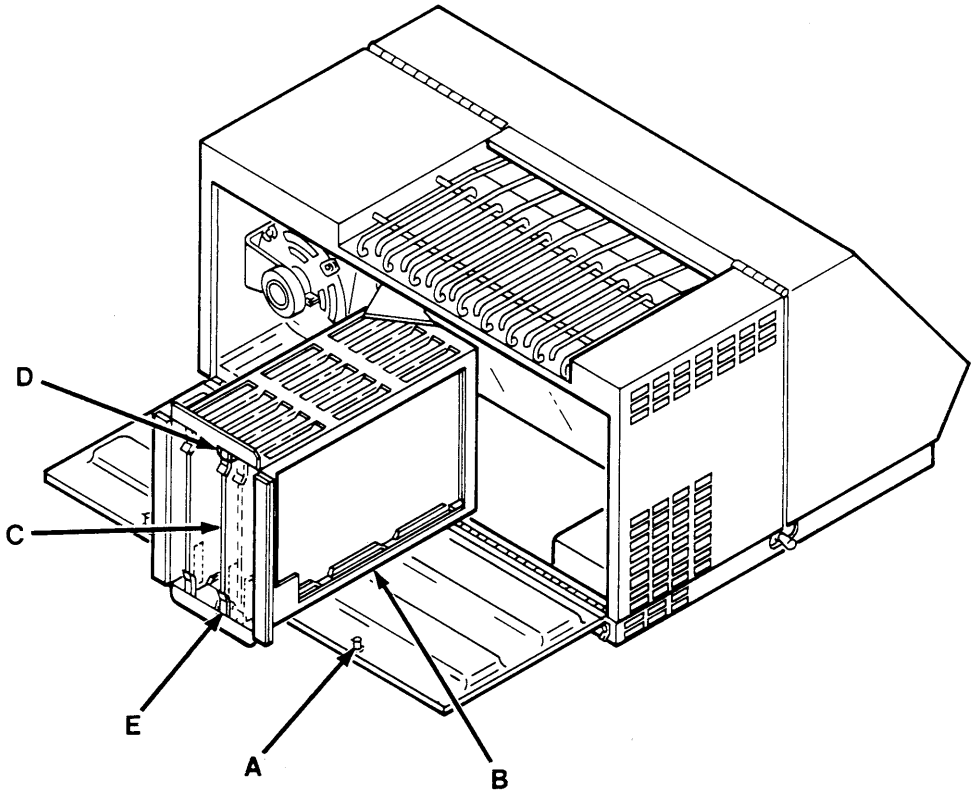


Figure 3−4. PCBA Removal − Pedestal Model Printer

Table 3−2. Hardware Jumper Configuration

JUMPER LOCATION	DESCRIPTION		
E3−E6	NTXCLK Input − Serial Interface Transmit Clock *		
E4−E7	NRXCLK Input − Serial Interface Receive Clock *		
E5−E8	NEXTCLK Input − Serial Interface External Clock *		
E6−E9	Clock to TC Input − Serial Interface *		
E7−E10	Clock to RC Input − Serial Interface *		
E8−E11	Timer C Output to Clock − Serial Interface *		
E14−E15	Dataproducts Strobe Polarity		In = Inverted
E18−E19	P6X80 Select	In = P6X80	Out = P6X40
E20−E21	P6X80 NRESYNC Timer		Must be IN for P6X80
E32−E33	P6X80 Phase Fire Enable		Must be IN for P6X80
E34−E35	27256 E−PROM 0		Must be IN
E36−E37	CPU Clock		Must be IN
E38−E39	P6X40 Hammer Load		Must be IN for P6X40
E39−E40	P6X80 Hammer Load		Must be IN for P6X80
E45−E46	27256 Font PROM 0		Must be IN
E49−E50	Data Latch Edge Select		In = Leading Edge
E50−E51	Data Latch Edge Select		In = Trailing Edge
E52−E53	ACK Edge Select		In = Leading Edge

**NOTE: Only one of the Serial Interface clocks can be selected by inserting the related jumper. Selecting one of these clocks may require cutting the related etch on the PCBA: For jumper E5−E8, cut E8−E11; for jumper E4−E7, cut E7−E10; for jumper E3−E6, cut E6−E9. Any of these changes should only be performed by a qualified technician.*

Control Panel Configuration Diagram

The Control Panel Configuration Diagram is a series of block diagrams that show the configuration menus and the parameters available within each menu. Boxes on the diagram represent the message display; the message that appears on the display is printed inside the box. The letters outside the boxes and adjacent to the directional arrows represent control panel function switches. When the indicated switch is pressed, the arrow leads to the displayed result of pressing that switch. The symbols used on the Control Panel Configuration Diagram are shown in Figure 3−5.

The diagram is presented in 3 levels, each level illustrating a particular set of parameter menus and values. The relationships between the three levels are shown in Figure 3−6.

Level I − Print Format

Line Spacing
Print Mode
Forms Length

Level II − Main Configuration Menus

Ribbon Life
Character Set
Application Compatibility
Paper Format
Host Interface
Load Parameters
Save Parameters
Diagnostics

Level III − Configuration Menu Parameters

Printer Protocol
Buffer Size
Uppercase Select
Printer Select
Paper Advance Switch
Power−On State
Unidirectional
Auto Line Feed
Define CR Code
Define LF Code
VFU Select
Perforation Skip
Paper Empty
PMD Fault
Modified Plot
Slew Relative
Centronics Interface Parameters
Dataproducts Interface Parameters
Serial RS−232 Interface Parameters
Configuration Printout
Print Data In Hex Code
Printer Test 80 Column Paper
Printer Test 132 Column Paper
Print Statistics

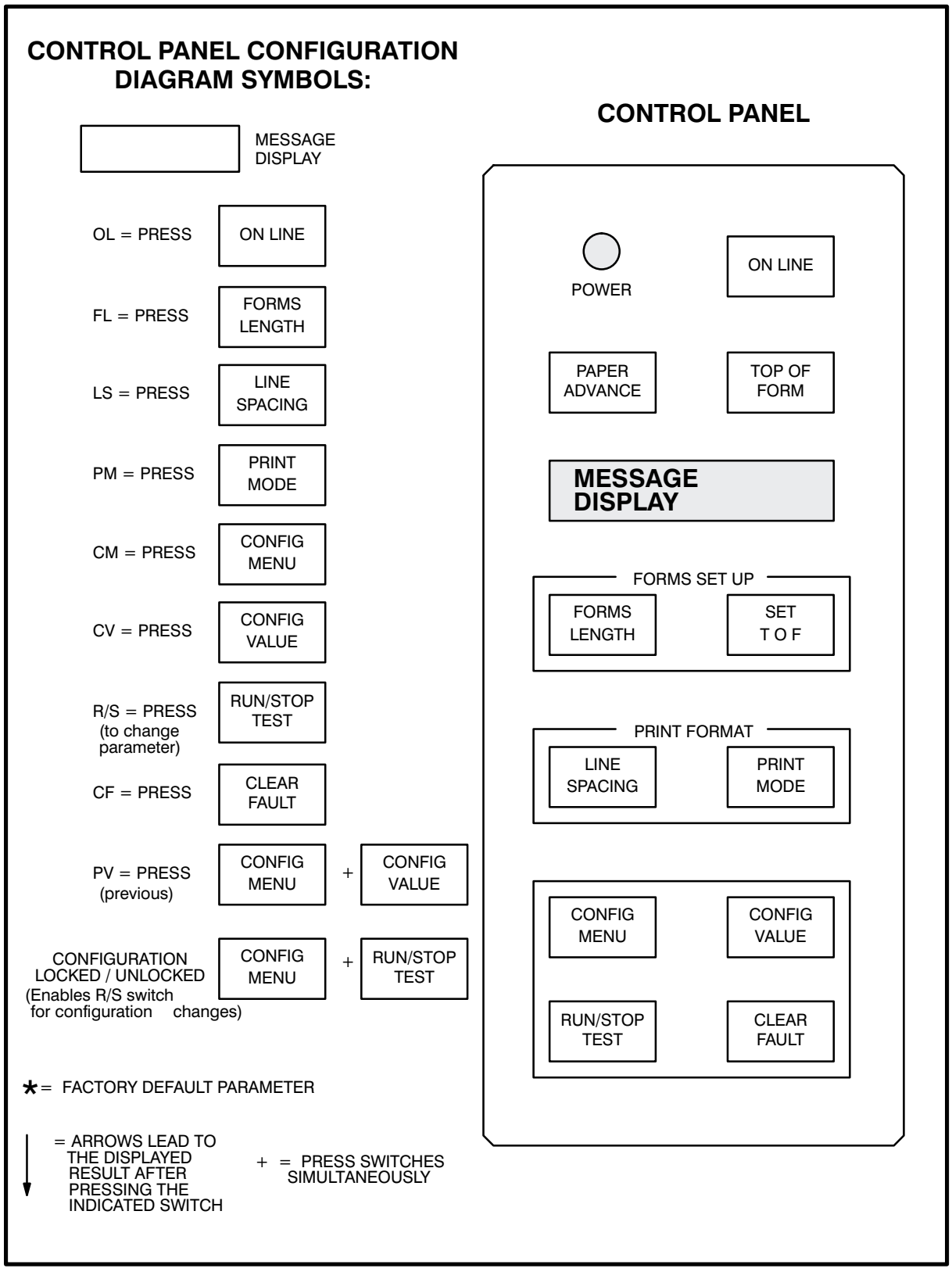


Figure 3−5. Control Panel Configuration Diagram Symbols

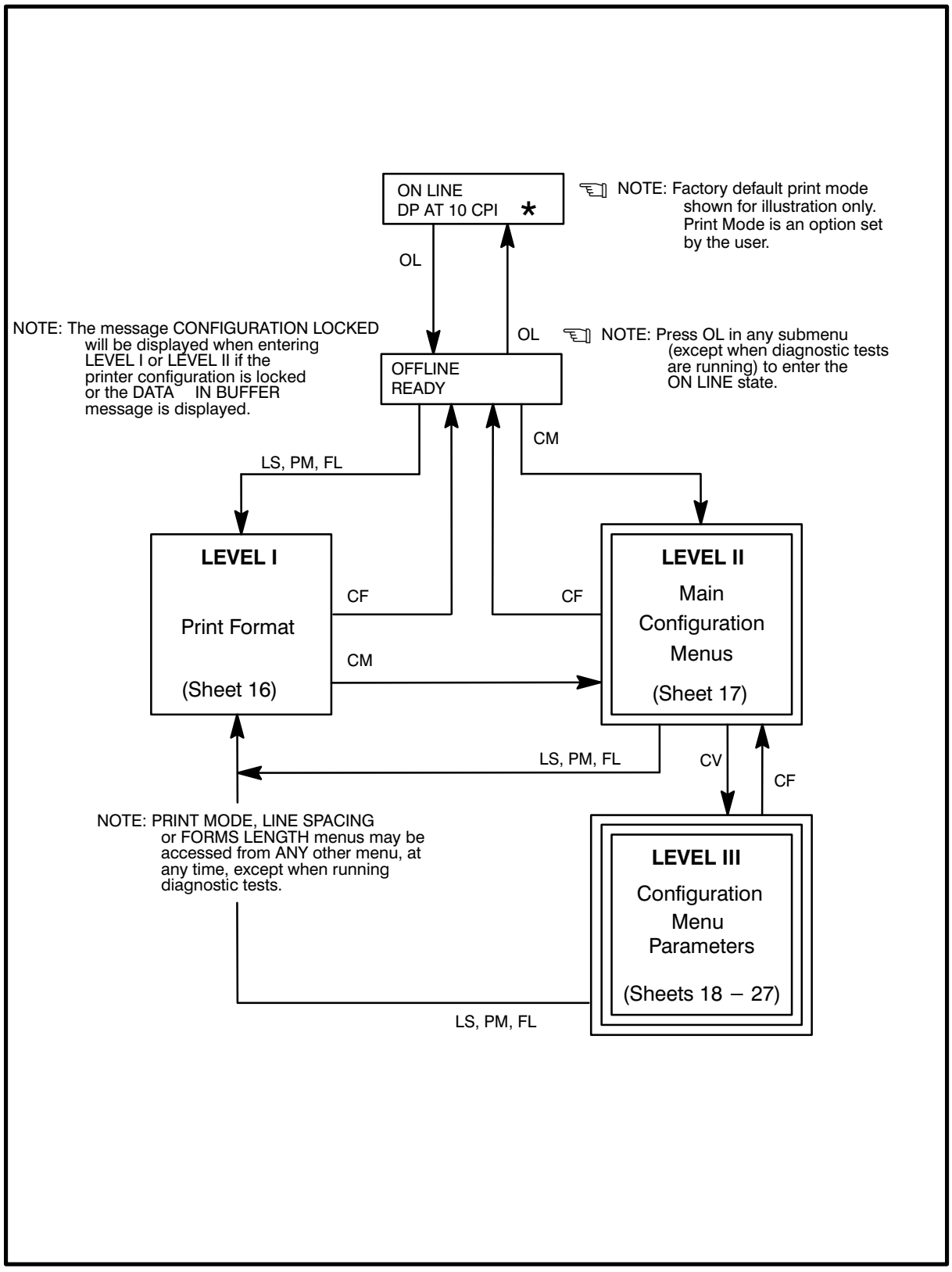
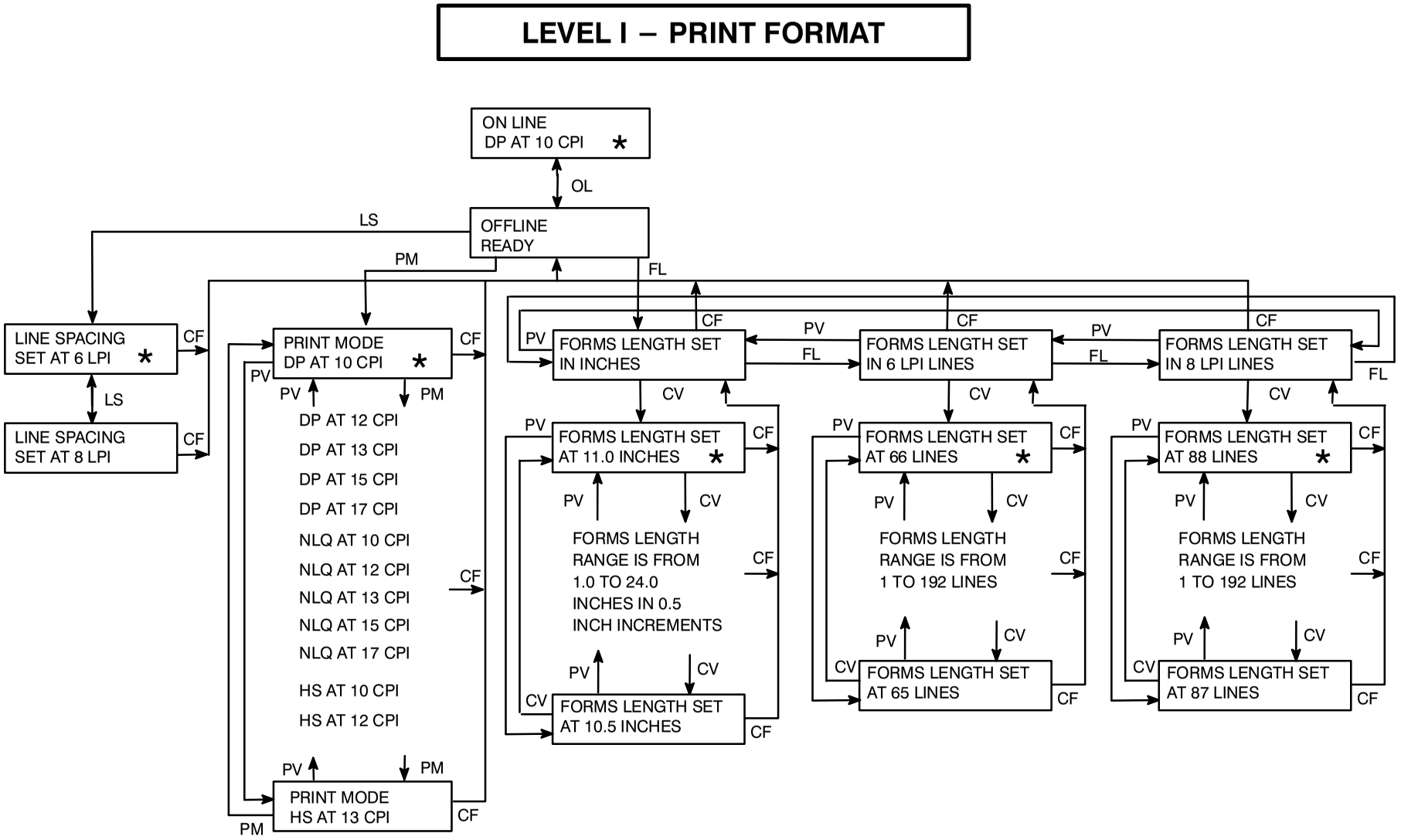
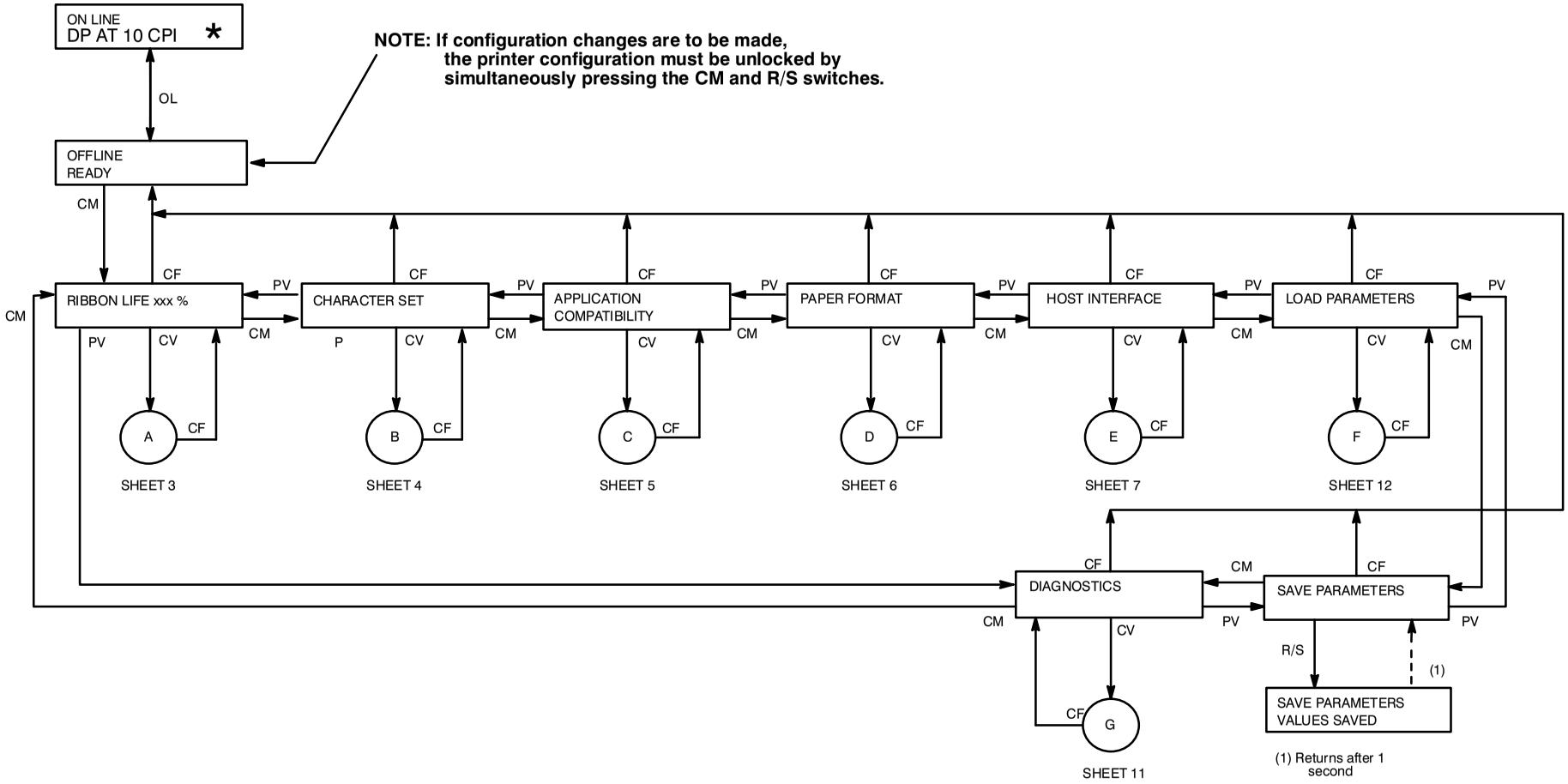

ON LINE
DP AT 10 CPI *
NOTE: Factory default print mode shown for illustration only. Print Mode is an option set by the user.
OL
OL
NOTE: Press OL in any submenu (except when diagnostic tests are running) to enter the ON LINE state.
NOTE: The message CONFIGURATION LOCKED will be displayed when entering LEVEL I or LEVEL II if the printer configuration is locked or the DATA IN BUFFER message is displayed.
OFFLINE
READY
CM
LS, PM, FL
LEVEL I
Print Format
(Sheet 16)
CF
CF
CM
LEVEL II
Main
Configuration
Menus
(Sheet 17)
LS, PM, FL
CV
CF
NOTE: PRINT MODE, LINE SPACING or FORMS LENGTH menus may be accessed from ANY other menu, at any time, except when running diagnostic tests.
LEVEL III
Configuration
Menu
Parameters
(Sheets 18 – 27)
LS, PM, FL

Figure 3−6. Control Panel Overview



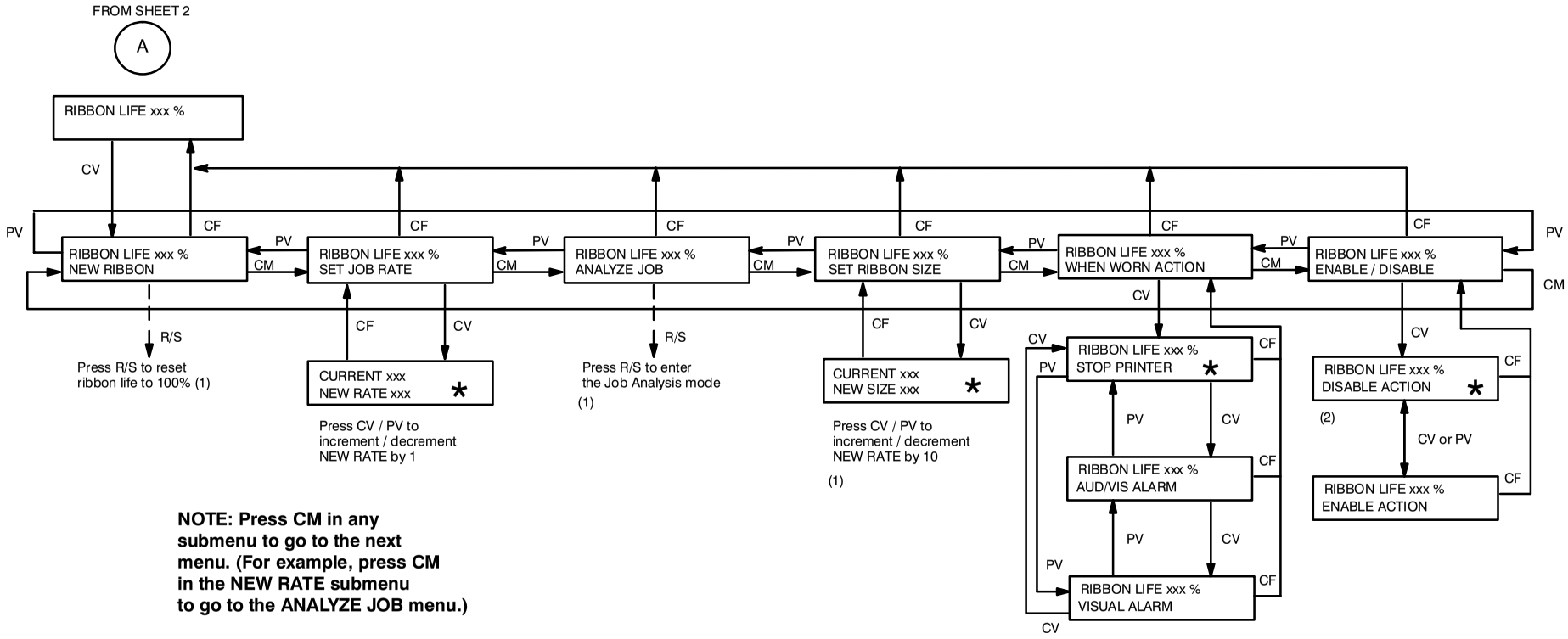
Control Panel Switch Function Diagram (Sheet 1 of 12)

LEVEL II – MAIN CONFIGURATION MENUS



Control Panel Switch Function Diagram (Sheet 2 of 12)

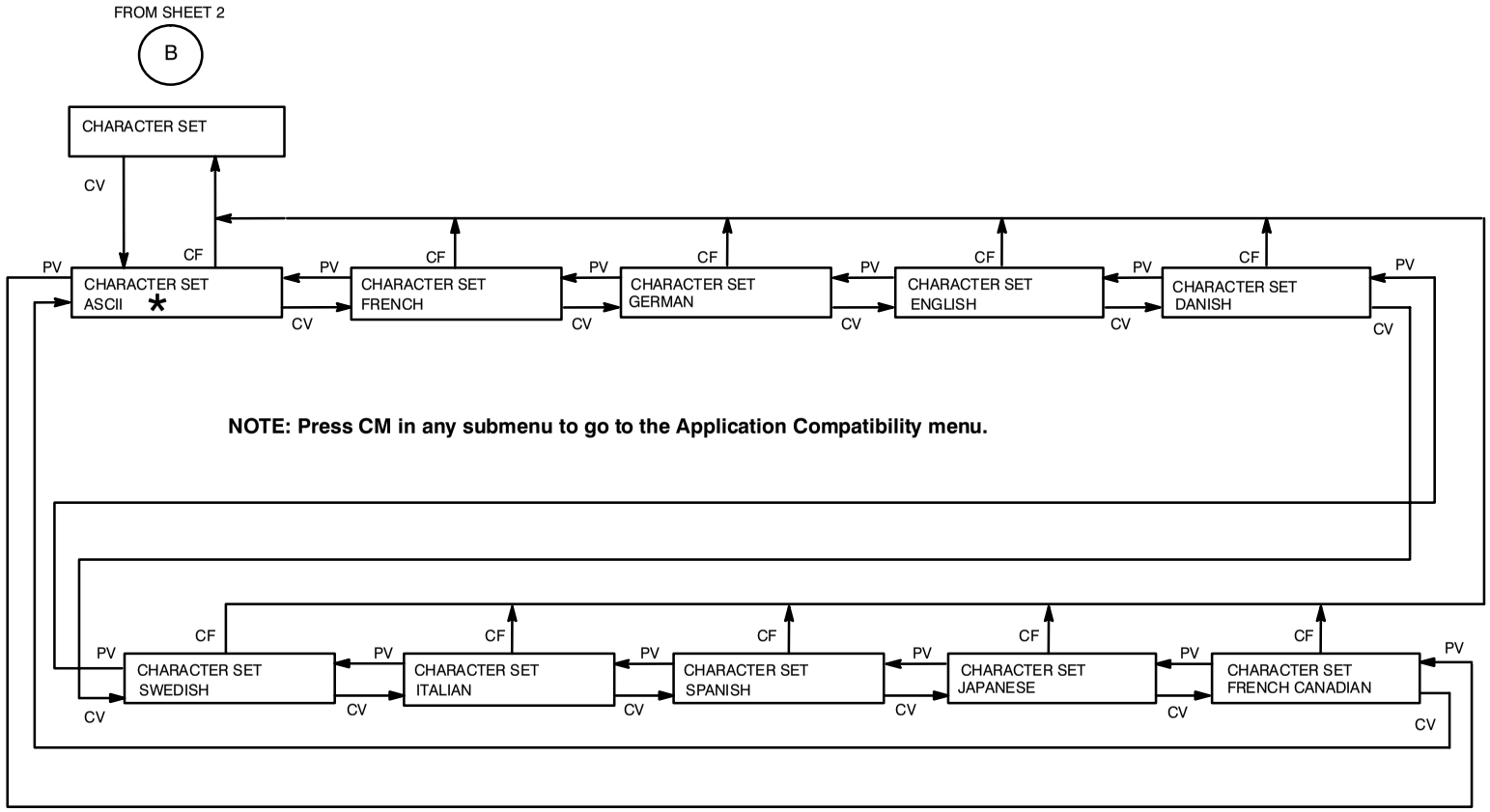
LEVEL III – CONFIGURATION MENU PARAMETERS



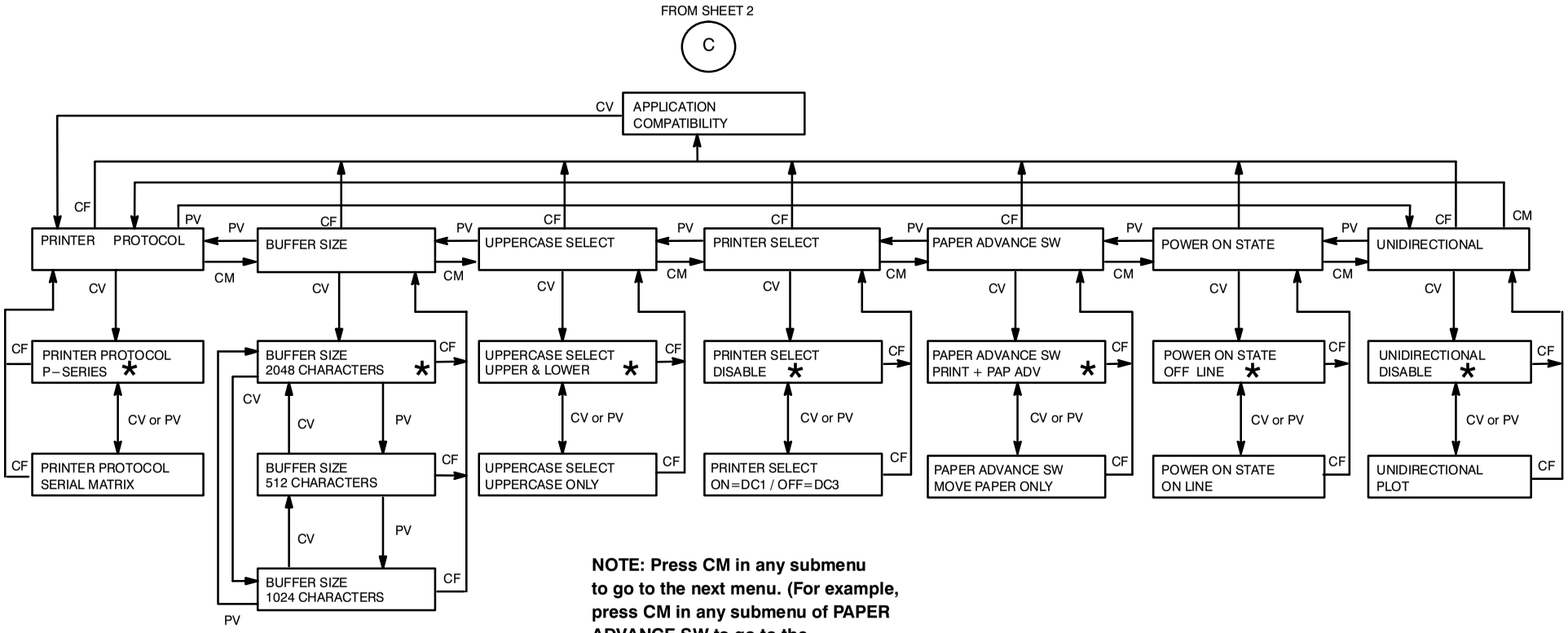
(1) A new ribbon must be installed before printing resumes, (before or after entering this menu selection), or a FAULT CONDITION CHANGE RIBBON will occur.

(2) The xxx% will disappear from all RIBBON LIFE xxx% menus while the ribbon action is disabled.

Control Panel Switch Function Diagram (Sheet 3 of 12)

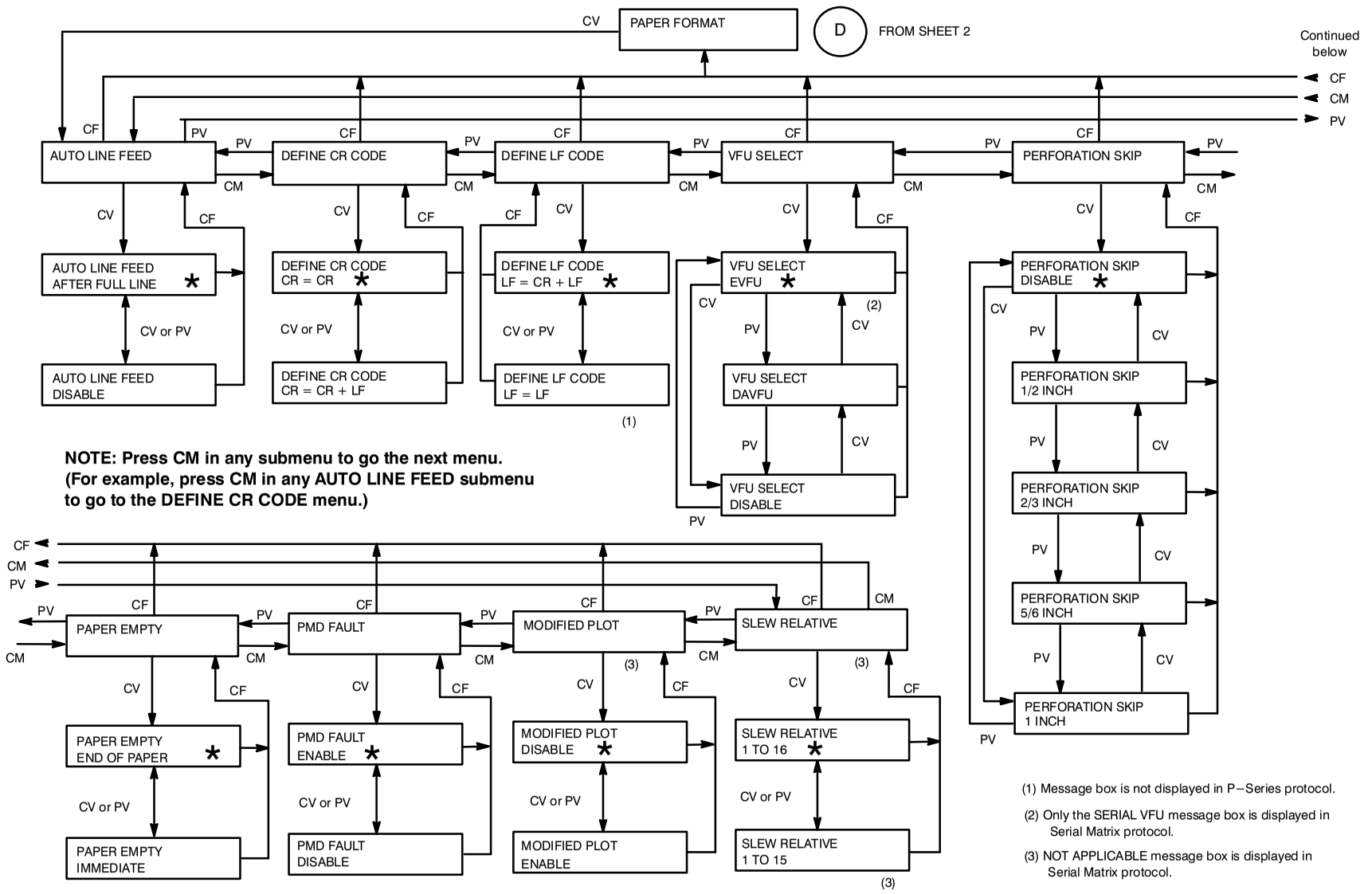


Control Panel Switch Function Diagram (Sheet 4 of 12)



NOTE: Press CM in any submenu to go to the next menu. (For example, press CM in any submenu of PAPER ADVANCE SW to go to the POWER ON STATE menu.)

Control Panel Switch Function Diagram (Sheet 5 of 12)



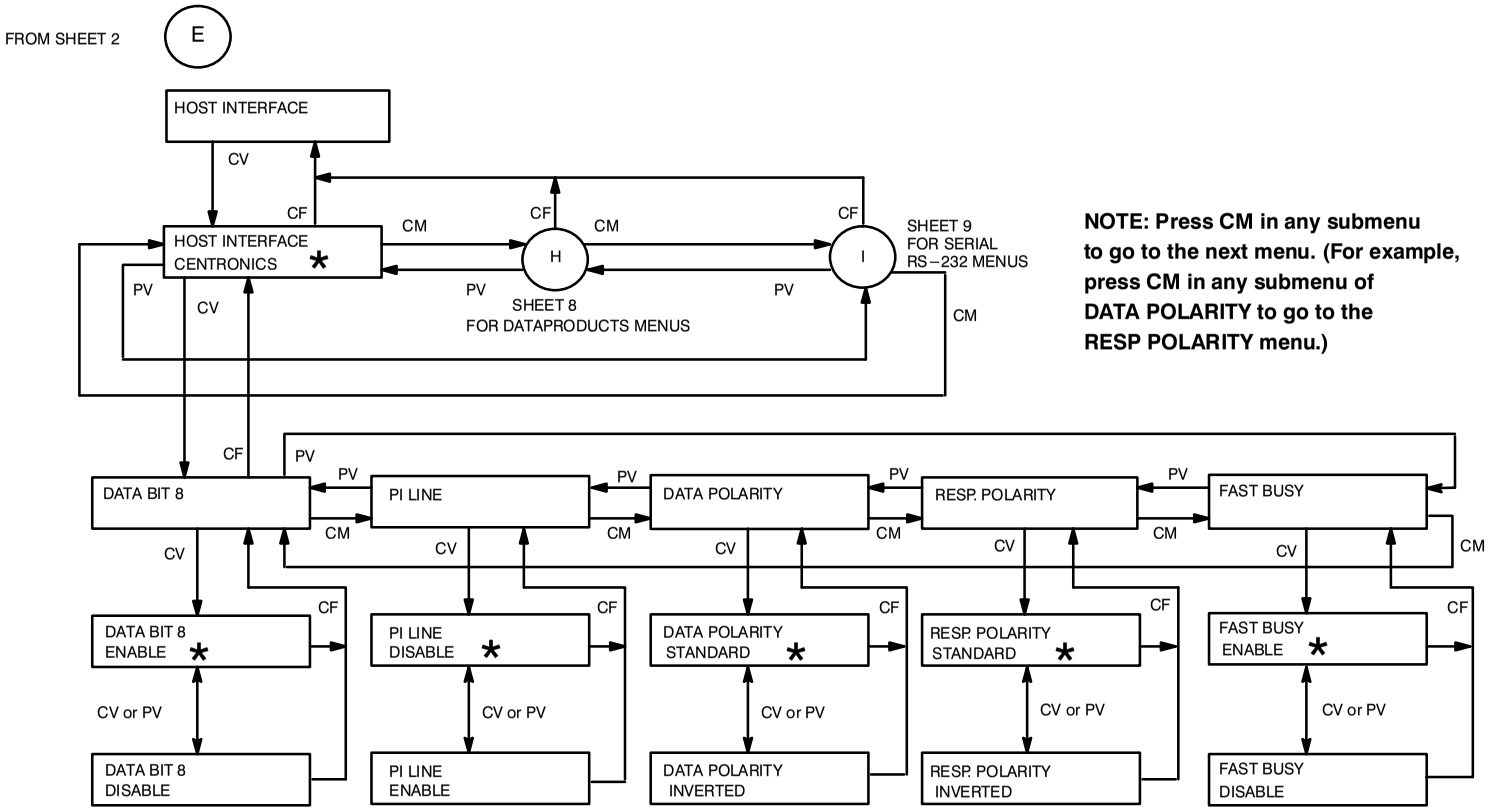
NOTE: Press CM in any submenu to go the next menu. (For example, press CM in any AUTO LINE FEED submenu to go to the DEFINE CR CODE menu.)

(1) Message box is not displayed in P−Series protocol.

(2) Only the SERIAL VFU message box is displayed in Serial Matrix protocol.

(3) NOT APPLICABLE message box is displayed in Serial Matrix protocol.

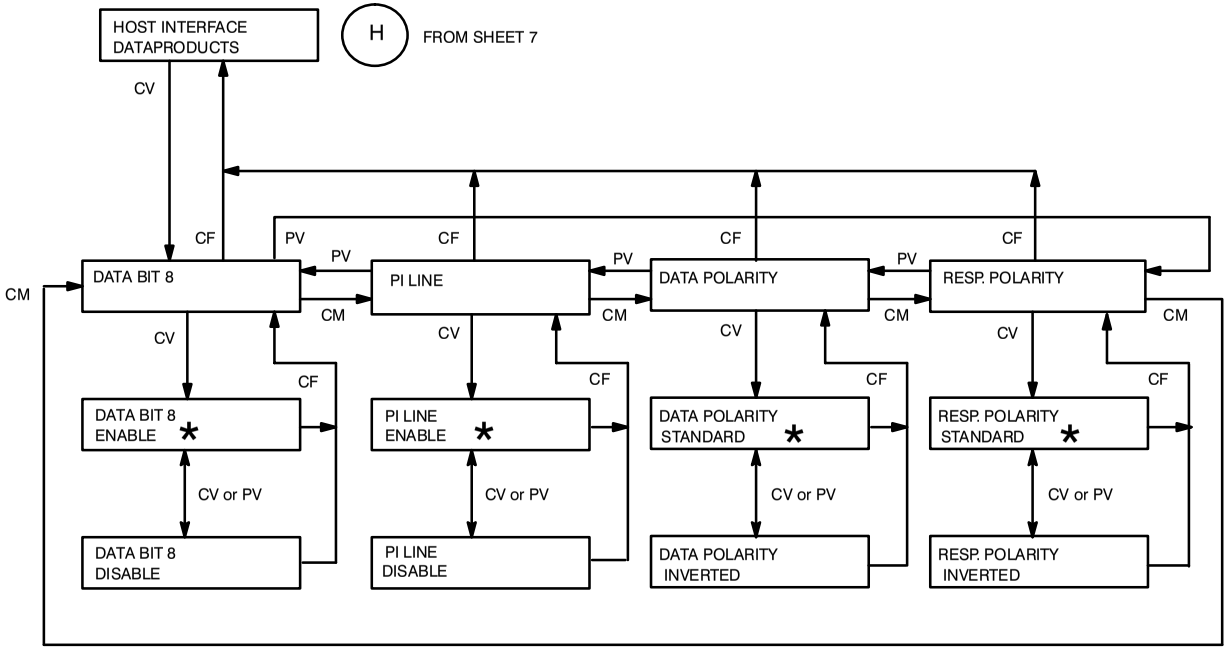
Control Panel Switch Function Diagram (Sheet 6 of 12)



NOTE: Press CM in any submenu to go to the next menu. (For example, press CM in any submenu of DATA POLARITY to go to the RESP POLARITY menu.)

NOTE: The strobe and ack edge are selected by hardware jumper.

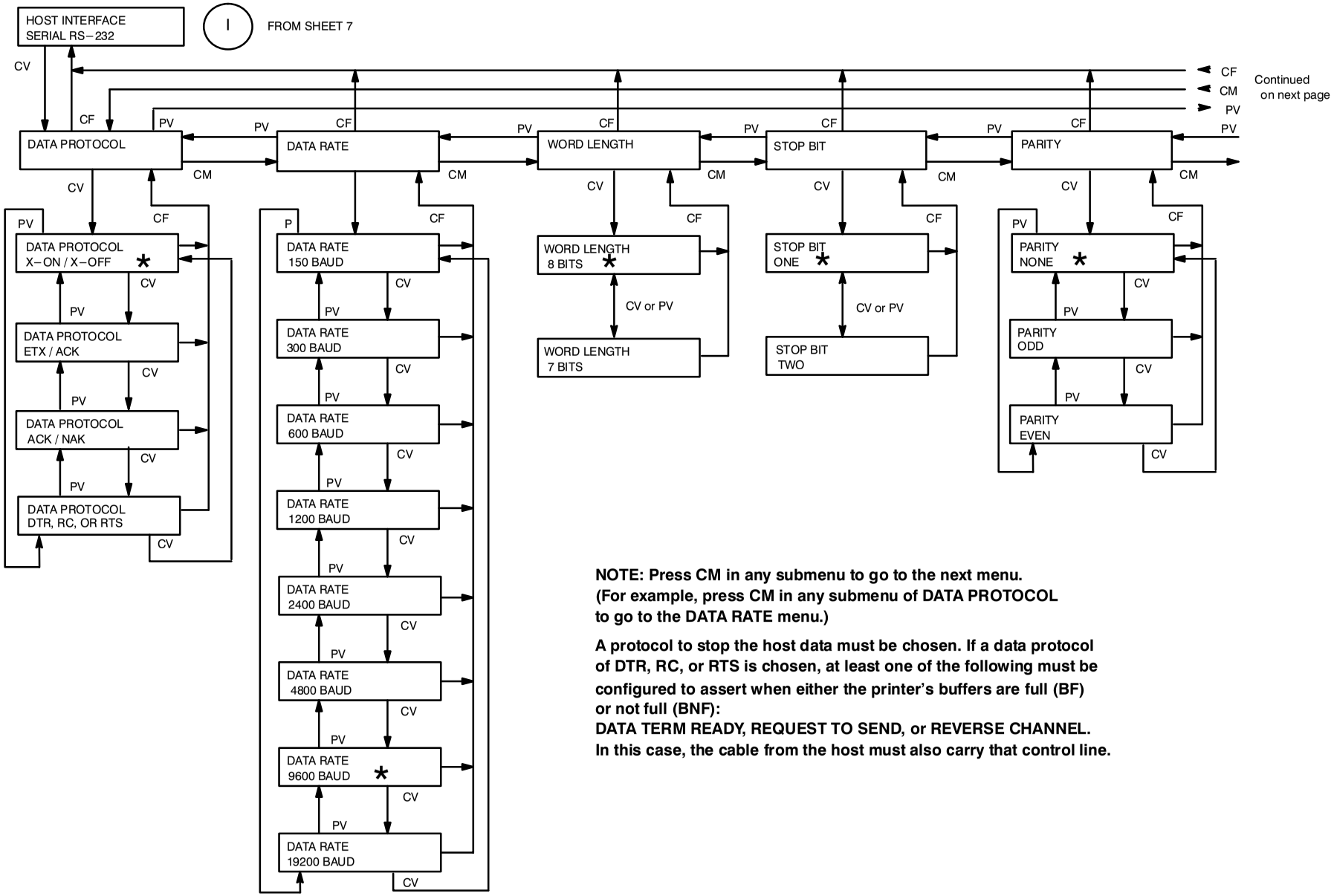
Control Panel Switch Function Diagram (Sheet 7 of 12)



NOTE: Press CM in any submenu to go to the next menu. (For example, press CM in any submenu of DATA BIT 8 to go to the PI LINE menu.)

The strobe and ack edge, and strobe polarity are selected by hardware jumper.

Control Panel Switch Function Diagram (Sheet 8 of 12)

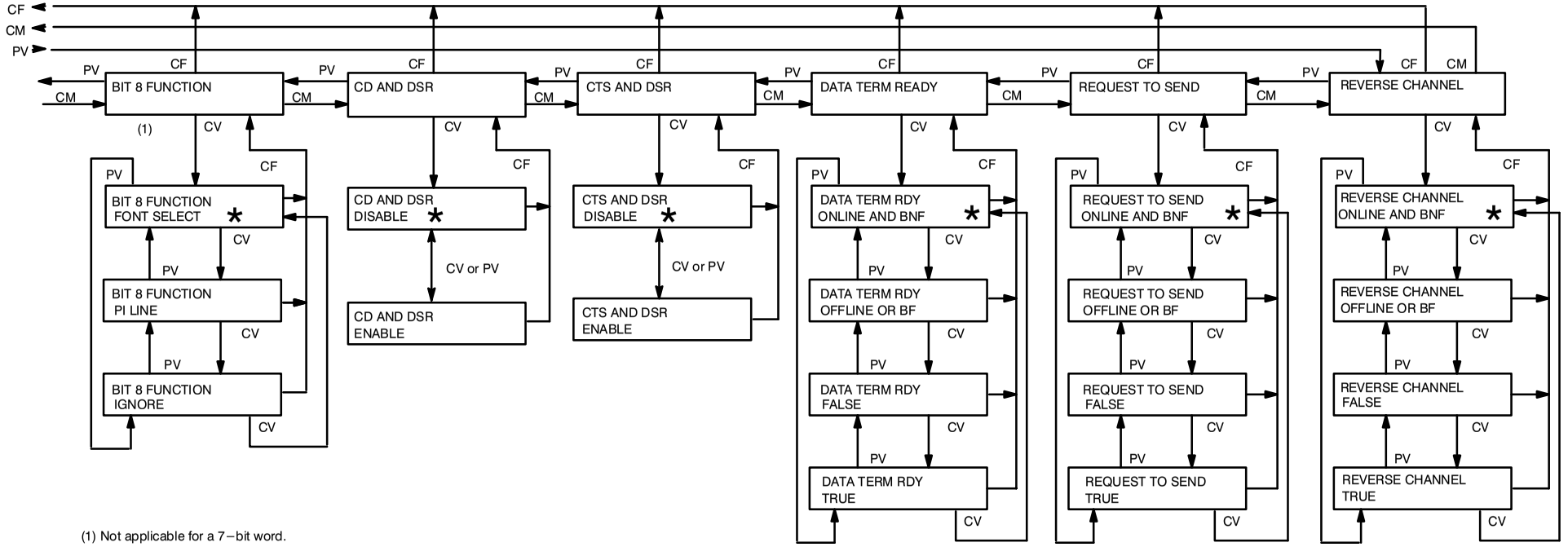


NOTE: Press CM in any submenu to go to the next menu. (For example, press CM in any submenu of DATA PROTOCOL to go to the DATA RATE menu.)

A protocol to stop the host data must be chosen. If a data protocol of DTR, RC, or RTS is chosen, at least one of the following must be configured to assert when either the printer's buffers are full (BF) or not full (BNF):
DATA TERM READY, REQUEST TO SEND, or REVERSE CHANNEL.
In this case, the cable from the host must also carry that control line.

Control Panel Switch Function Diagram (Sheet 9 of 12)

Continued from
previous page

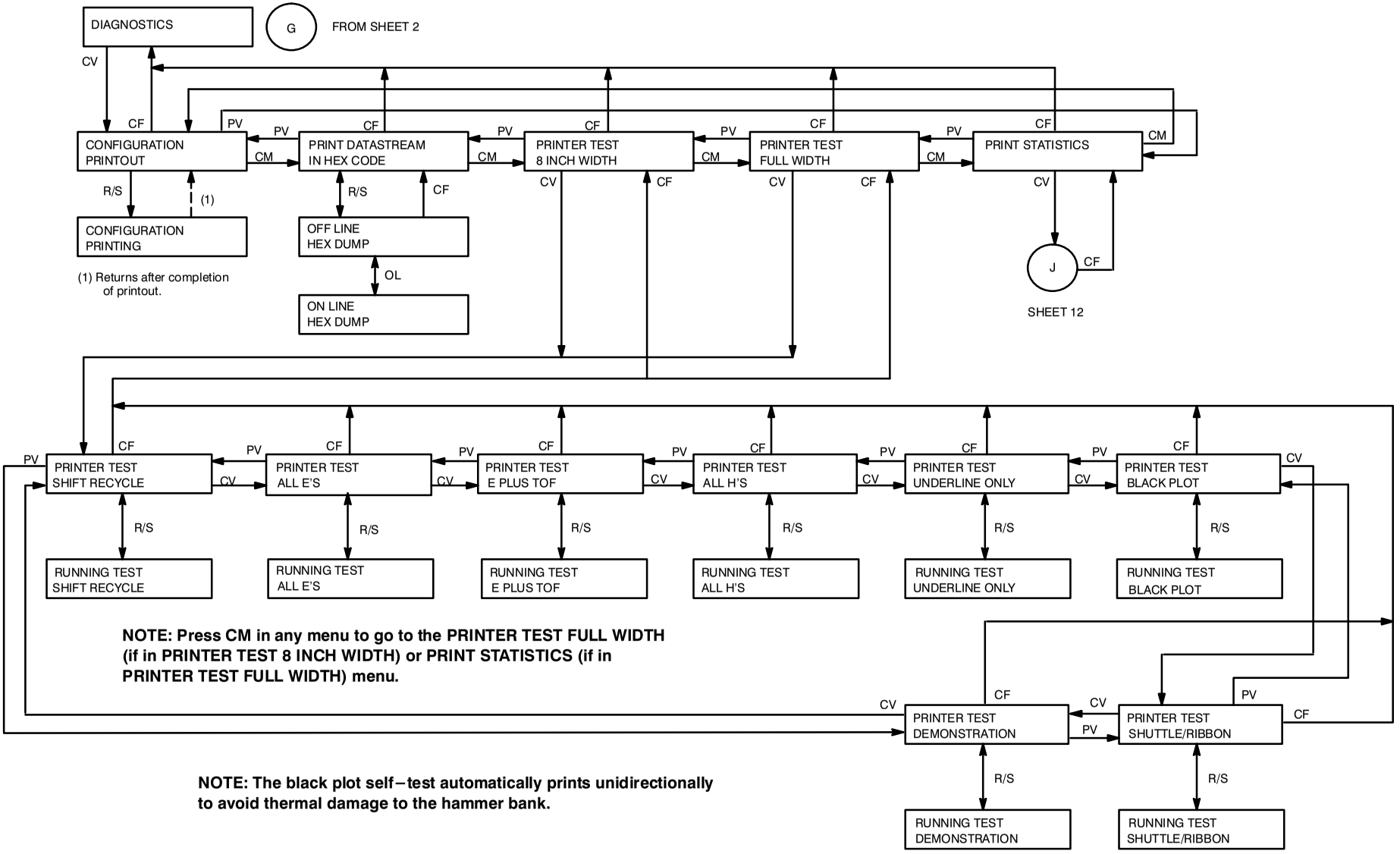


(1) Not applicable for a 7−bit word.

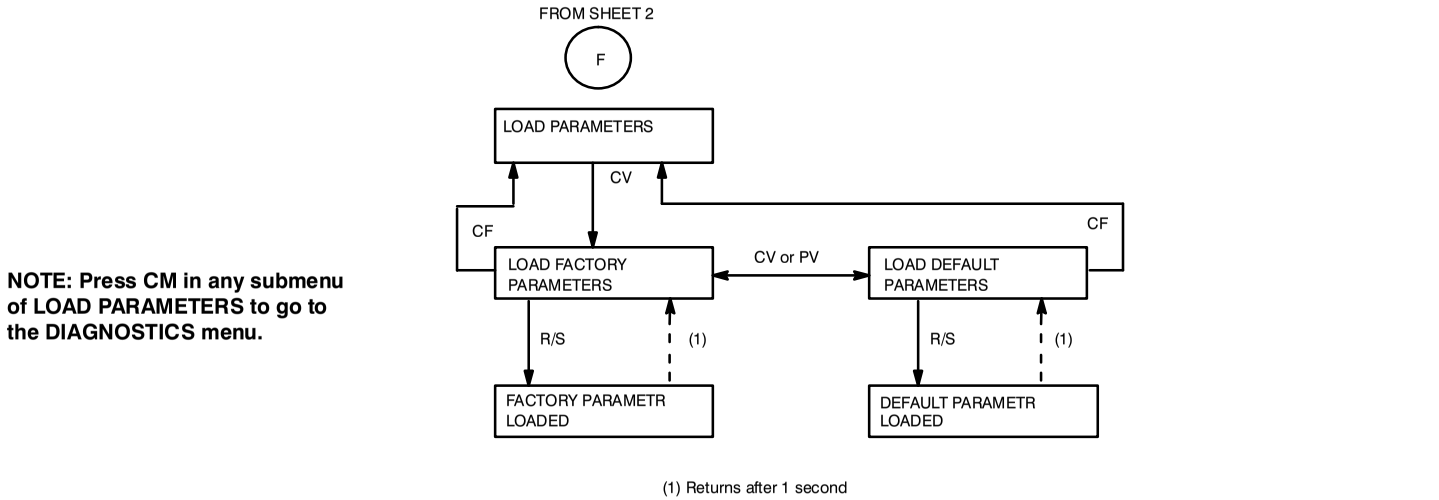
NOTE: Press CM in any submenu to go to the next menu. (For example, press CM in any submenu of DATA TERM READY to go to the REQUEST TO SEND menu.)

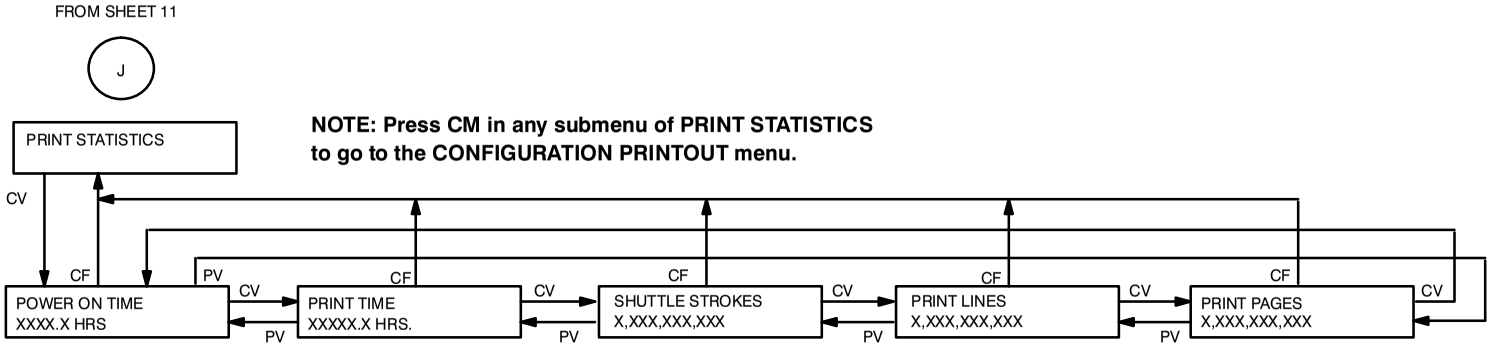
When CD and DSR is enabled, both CD and DSR must be asserted for the printer to receive data. When CTS and DSR is enabled, both CTS and DSR must be asserted before the printer can send protocol characters, such as xoff or xon, to the host.

Control Panel Switch Function Diagram (Sheet 10 of 12)


DIAGNOSTICS
G
FROM SHEET 2
CV
CF
PV
CONFIGURATION PRINTOUT
CM
PRINT DATASTREAM IN HEX CODE
PRINTER TEST 8 INCH WIDTH
PRINTER TEST FULL WIDTH
PRINT STATISTICS
R/S
(1)
CONFIGURATION PRINTING
OFF LINE HEX DUMP
OL
ON LINE HEX DUMP
(1) Returns after completion of printout.
J
SHEET 12
PRINTER TEST SHIFT RECYCLE
PRINTER TEST ALL E'S
PRINTER TEST E PLUS TOF
PRINTER TEST ALL H'S
PRINTER TEST UNDERLINE ONLY
PRINTER TEST BLACK PLOT
RUNNING TEST SHIFT RECYCLE
RUNNING TEST ALL E'S
RUNNING TEST E PLUS TOF
RUNNING TEST ALL H'S
RUNNING TEST UNDERLINE ONLY
RUNNING TEST BLACK PLOT
NOTE: Press CM in any menu to go to the PRINTER TEST FULL WIDTH (if in PRINTER TEST 8 INCH WIDTH) or PRINT STATISTICS (if in PRINTER TEST FULL WIDTH) menu.
PRINTER TEST DEMONSTRATION
PRINTER TEST SHUTTLE/RIBBON
RUNNING TEST DEMONSTRATION
RUNNING TEST SHUTTLE/RIBBON
NOTE: The black plot self−test automatically prints unidirectionally to avoid thermal damage to the hammer bank.

Control Panel Switch Function Diagram (Sheet 11 of 12)





Control Panel Switch Function Diagram (Sheet 12 of 12)

CHAPTER 4

GRAPHICS

Introduction

All P6000L/P6200L Series printers are capable of standard *Printronix* Odd/Even Dot Plotting for normal and high density graphics as well as Bit Image graphics with single, double density, and double speed double density modes. Odd/Even dot plotting is available for graphics when the printer is in the P−Series mode; Bit Image graphics is used when the printer is in the Serial Matrix mode. Printing text and characters is the default mode of operation. Consequently, each line of graphics data must include a graphics control code to enable the printer for the desired graphics mode of operation.

The following graphics information is presented in this chapter:

- Serial Matrix Compatible Bit Image Graphics
- P−Series Compatible Plot Mode
- Combining Graphics and Text

Serial Matrix Compatible Bit Image Graphics

Bit Image graphics is used with the printer in the IBM Graphics Printer Serial Matrix mode. Bit Image Graphics are created by printing a series of vertical Bit Image data bytes which represent the binary code bit pattern. The Bit Image mode utilizes the “1” or true bits from a binary data byte to print dot patterns. These data bytes are actually the binary equivalent of ASCII character decimal values 0 through 255. For example, the binary data byte bit pattern for the ASCII character “A” (hex 41, decimal 65) is shown below in Figure 4−1.

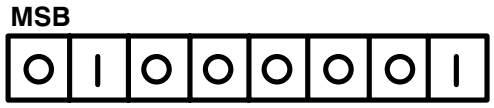


Figure 4−1. Binary Data Byte

If this data byte is rotated vertically, the result is a vertical data byte pattern with the most significant bit (MSB) at the top as shown in Figure 4−2.

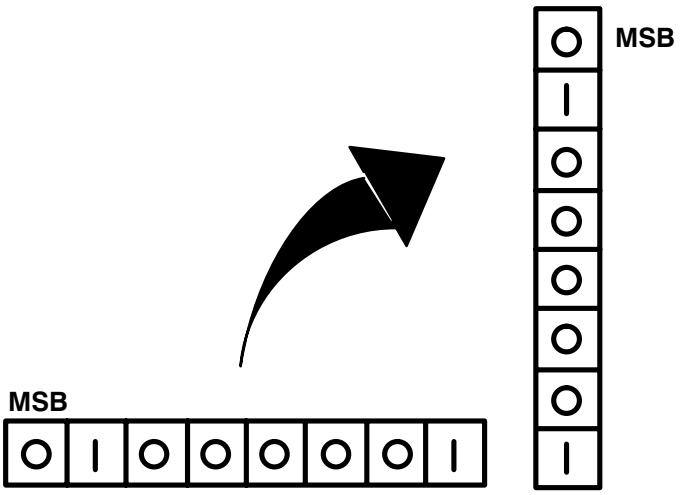


Figure 4−2. Vertical Data Byte Pattern

If each “1” or true bit is plotted, the result is a Bit Image plot of the ASCII character “A”. The relationship of ASCII character, decimal value, and Bit Image plot is shown in Figure 4−3.

ASCII CHARACTER	DECIMAL VALUE	BINARY CODE EQUIVALENT	TO	VERTICALLY ROTATED DATA BYTE	BIT IMAGE PATTERN
A =	65 =	128 64 32 16 8 4 2 1		MSB =	

Figure 4−3. Bit Image Pattern from an ASCII Character

Any byte, such as the one in the previous example, can be identified by its binary, octal, hexadecimal, or decimal equivalent and subsequently used to generate a Bit Image pattern. A table of the standard ASCII character set and equivalences is included in Appendix A. Use this table to quickly identify the various equivalences of ASCII characters. Bit Image plotting is not limited to printable ASCII characters; Bit Image patterns can be plotted for any 8−bit data byte with decimal values ranging from 0 to 255.

NOTE: Printing solid black bit image for extended periods will overheat the hammer bank.

Plotting a Bit Image Pattern

A Bit Image pattern can be developed as follows:

1. Layout the graphic to be printed on a quadrille pad or graph paper.
2. Determine the decimal equivalence of each Bit Image data byte required to produce the pattern.
3. Write a program to generate the complete pattern.
4. Enter and run the program on the host computer.

Figure 4−4 illustrates steps 1 and 2. Eight vertical cells are used to create the Bit Image pattern corresponding to the eight bits of the vertically rotated data byte. Dots are placed in the cells to provide a visual representation of the graphic to be printed. Each dot corresponds to a “1” or true bit in the data byte. In this example, seven Bit Image data bytes are required to create the dot pattern. These seven data bytes must be specified in the written program (step 3) to generate the entire pattern.

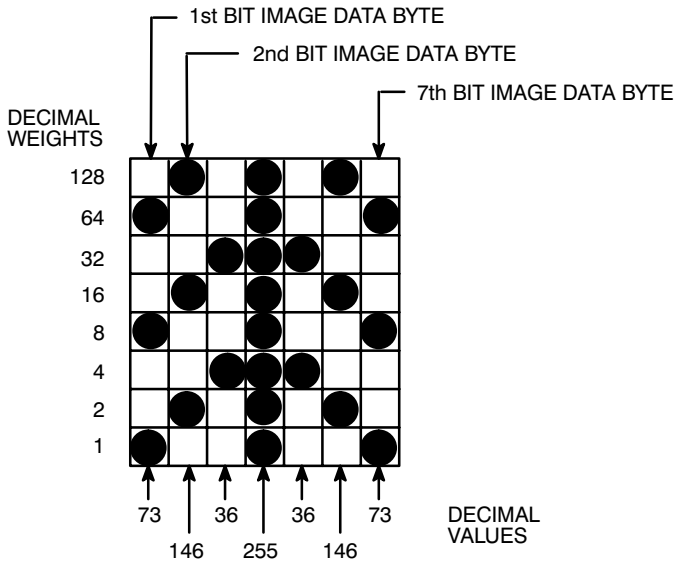


Figure 4−4. Bit Image Pattern Plan

A Bit Image pattern is easily defined by determining the decimal equivalent of the binary data byte. This decimal value may then be included in a program data statement that generates the final Bit Image pattern. To determine the decimal value of a data byte, each dot’s decimal weight is added together. For the seven bytes shown in Figure 4−4, the decimal values are computed as shown in Table 4−1.

Table 4−1. Example Bit Image Pattern Decimal Values

BIT IMAGE DATA BYTE	DECIMAL WEIGHT	DECIMAL VALUE
1 st byte	64 + 8 + 1	= 73
2 nd byte	128 + 16 + 2	= 146
3 rd byte	32 + 4	= 36
4 th byte	128 + 64 + 32 + 16 + 8 + 4 + 2 + 1	= 255
5 th byte	32 + 4	= 36
6 th byte	128 + 16 + 2	= 146
7 th byte	64 + 8 + 1	= 73

Bit Image Density

Bit Image graphics may be printed in different dot densities selected by control code.

Control code ESC K selects the Single Density mode.

Control code ESC L selects the Double Density mode.

Control code ESC Y selects the Double Speed, Double Density mode.

Control code ESC Z selects the Quadruple Density mode.

In Single Density Bit Image graphics from the Data Processing print mode, printed dot density is 60 dots per inch (dpi) horizontal and 72 dpi vertical. From the Correspondence print mode, horizontal dot density is 120 dpi and vertical density is 144 dpi.

The Double Density mode prints up to twice the number of dots per inch horizontally (up to 120 dpi from the Data Processing mode). The vertical dot density remains the same as in the Single Density mode. Double horizontal density requires twice the number of input data bytes to print the same length line as Single Density. Printing the additional dots reduces the printing speed by half.

When the Double Density, Double Speed control code is received, the data can be printed up to double the current horizontal dot density but all adjacent dots are removed which will affect the final density of the printed image. Since double density graphics are printed at half speed, double density double speed graphics are printed at the same speed as single density graphics.

Quadruple Density graphics is printed by pairing adjacent bit image bytes. The paired data is then printed in the Double Density mode

Bit Image Programming Format

The syntax of the Bit Image expression must be correct. The expression must include the appropriate dot density control code, the exact number of data to be plotted, and the data itself. The general Bit Image expression is:

ESC,CC,(n1),(n2),DATA

where:

ESC	=	the Serial Matrix compatible header
CC	=	K, L, or Y to select dot density; K = single, L = double, Y = double density double speed, and Z = quadruple density
n1, n2	=	define the number of data bytes to be printed
DATA	=	the dot pattern bytes

The values for n1 and n2 must be specified in the control code expression. They are defined as:

n1 = number of data bytes MOD 256

n2 = INT (number of data bytes\256)

The modulus arithmetic operator MOD refers to the integer value that is the remainder of an integer division. The INT operator refers to integer division and is denoted by the backslash \. Therefore, n1 is the remainder of the number of data divided by 256 and n2 is the integer value of the number of data divided by 256.

n1 = (number of data bytes)−(n2 x 256)

n2 = (number of data bytes)\256

If the number of data bytes to be printed is less than 256, n2 equals zero and n1 equals the number of data bytes to be printed.

The following examples illustrate the procedure to determine the Bit Image program statement.

Print 450 data bytes, single density

n2 = 450\256 = 1

n1 = 450−(1x256) = 194

The program statement is:

ESC K (194)(1)(DATA)

Print 700 data bytes, single density

n2 = 700\256 = 2

n1 = 700−(2x256) = 700−512 = 188

The program statement is:

ESC K (188)(2)(DATA)

Print 180 data bytes, single density

n2 = 180\256 = 0

n1 = 180−(0x256) =180−0 = 180

The program statement is:

ESC K (180)(0)(DATA)

The number of data bytes and the n1, n2 definition must be equal. If too few data bytes are sent, printing will not begin until sufficient data is received. Any characters following n1 and n2 will be interpreted and plotted as data until the n1, n2 definition is satisfied.

If excess data is received, only the defined amount will be plotted. Excess data will be interpreted as printable characters or control codes. The maximum number of data bytes (when using 132 column paper) that can be included in the DATA portion of the program statement varies according to the operating mode. At 60 dpi, Single Density = 792 bytes; Double Density = 1584 bytes.

A detailed description of the individual Bit Image control codes with examples is provided in the Programming chapter.

NOTE: Depending on the host computer system, it may be necessary to include a width statement within the BASIC program.

The following sample program written in BASIC produces Single Density Bit Image graphics of the pattern shown in Figure 4−4. The 7 data bit pattern is repeated 40 times. The printed result of running the program is shown in Figure 4−5.

```
10 LPRINT "Single Density Bit Image Graphics"
20 LPRINT CHR$(27);"K";CHR$(24);CHR$(1);
30 FOR N=1 TO 40
40 RESTORE
50 FOR I=1 TO 7
60 READ R
70 LPRINT CHR$(R);
80 NEXT I
90 NEXT N
100 DATA 73, 146, 36, 255, 36, 146, 73
110 LPRINT
```

Figure 4−5. Sample Single Density Bit Image Graphics

P−Series Compatible Plot Mode

This part of the Graphics chapter describes the P−Series compatible odd/even dot Plot mode of operation. Plot mode allows any individual dot position to be addressed and printed. This enables you to produce a variety of graphics including bar codes, complex curve graphs, pie and bar charts, block characters, or halftones. The plot commands indicated in this section may also be accessed in the Serial Matrix mode.

Plot Density

Plot density refers to the number of dots per inch (dpi) printed in a single dot row. Two types of plot density are available with P−Series Plot mode graphics: normal density and high density. The densities can be mixed within the printed page on a dot row−by−row basis, but the two densities cannot be mixed on the same dot row.

Normal density plotting is selected with the odd dot plot control code ENQ (05 hex). The odd numbered dot columns are addressed to produce a horizontal and vertical density that varies based on the mode of operation: 60 dpi horizontal and 72 dpi vertical for Data Processing (DP) mode, 120 dpi horizontal and 144 dpi vertical for Correspondence (NLQ) mode, and 60 dpi horizontal and 48 dpi vertical for High Speed mode. Figure 4−6 illustrates normal density dot plot.

Figure 4−6. Normal Density Plot

High density plotting is selected with the even dot plot control code EOT (04 hex) in conjunction with the odd dot plot control code ENQ (05 hex). The odd and even numbered dot columns are addressed to double the horizontal density with a maximum of 1584 dots in a single dot row. The vertical density remains the same in normal and high density plotting. Figure 4−7 illustrates high density plotting.

Figure 4−7. High Density Plot

NOTE: When printing black plot for extended periods, enable unidirectional plot to prevent overheating the hammer bank.

Plot Data Line Format

A P−Series compatible plot data line contains a maximum of 132 data bytes, a plot mode control code, and a line terminator as shown in Figure 4−8. The first data byte in the line addresses the dot positions to print in the first character column; the second data byte addresses the dot positions to print in the second character column, etc.

The P−Series Plot mode control code is either odd dot plot (05 hex) or even dot plot (04 hex), depending on the desired plot density, and should occur before any of the data bytes. The line terminator used is commonly a line feed (0A hex), but a form feed (0C hex) can also be used. VFU commands cannot be used as a line terminator in the Plot mode.

For normal density plot, the odd dot plot control code is sent along with the data bytes and a line terminator. In odd dot plot, a line feed control code used as the line terminator causes the contents of the buffer to be plotted and advances the paper a single dot row based on the vertical density of the current mode. If a form feed control code is used as the line terminator, the contents of the buffer are plotted and the paper is advanced to the next top−of−form position. The printer then defaults to the print mode.

For high density plot, the even dot plot and odd dot plot control codes are used in conjunction with two data lines. The even dot plot control code is sent with the first data line along with the line terminator. The line terminator, either a form feed or a line feed, causes the contents of the buffer to be plotted in the even dot columns but does not advance the paper. The printer waits for the second line of data using the odd dot plot control code and a line terminator. If a line feed control code is used as the line terminator of the second line, data in the buffer is plotted in odd dot columns of the same row where even dot column data was just plotted, paper is advanced one dot row (at the vertical density of the current mode), and the printer defaults to the print mode. If a form feed is used as the line terminator of the second data line, the same action occurs except the paper is advanced to the top of the next form rather than one dot row.

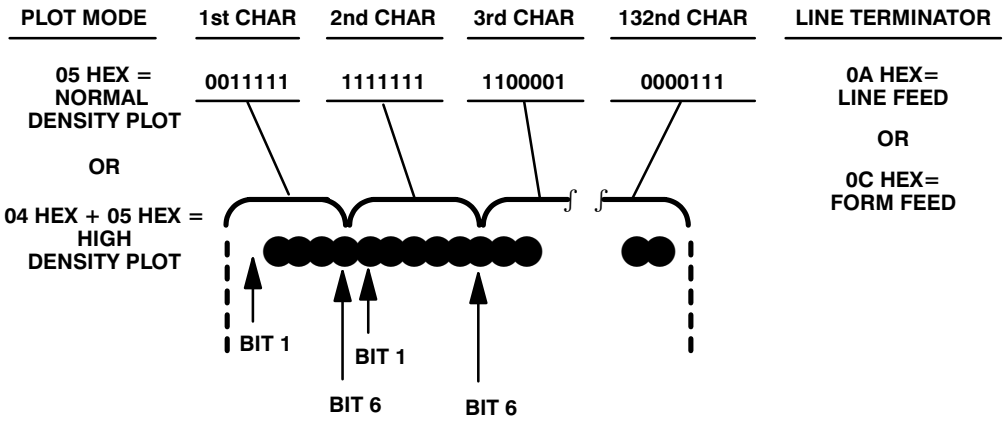


Figure 4−8. Plot Data Line Format

Plot Data Byte Format

Each data byte specifies six of the twelve dot columns that compose one character column. Using odd dot plot, bits 1 to 6 of the data byte address the odd numbered dot columns; using even dot plot, bits 1 to 6 of the data byte address the even numbered dot columns. Bit 6 and/or bit 7 of the data byte must be a “1” (or true) bit in the Plot mode. Bit 8 of the data byte is not used in the Plot Mode and can be either 1 or 0.

As shown in Figure 4−9, a dot is printed at the location addressed by each of bits 1 to 6 in the data byte that is set (1 or true). Consequently, the binary equivalent of the plot data bytes must be known to accurately address specific dot positions. Table 4−2 presents the binary equivalents and resultant dot patterns of the standard ASCII characters.

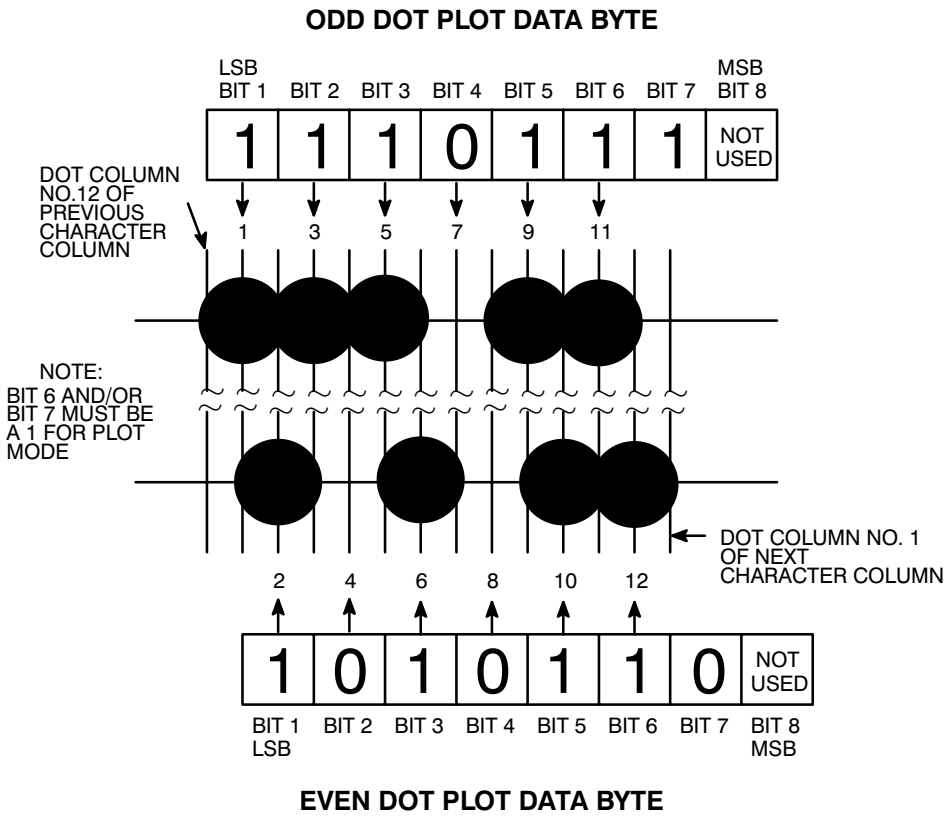


Figure 4−9. P−Series Plot Data Byte Format

Table 4–2. Plot Data Byte Dot Patterns

BINARY	OCT	DEC	HEX	ASCII	2 4 6 8 10 12 1 3 5 7 9 11	BINARY	OCT	DEC	HEX	ASCII	2 4 6 8 10 12 1 3 5 7 9 11	BINARY	OCT	DEC	HEX	ASCII	2 4 6 8 10 12 1 3 5 7 9 11
0100000	040	32	20	Space		1000000	100	64	40	@		1100000	140	96	60	‘	
0100001	041	33	21	!		1000001	101	65	41	A		1100001	141	97	61	a	
0100010	042	34	22	”		1000010	102	66	42	B		1100010	142	98	62	b	
0100011	043	35	23	#		1000011	103	67	43	C		1100011	143	99	63	c	
0100100	044	36	24	$		1000100	104	68	44	D		1100100	144	100	64	d	
0100101	045	37	25	%		1000101	105	69	45	E		1100101	145	101	65	e	
0100110	046	38	26	&		1000110	106	70	46	F		1100110	146	102	66	f	
0100111	047	39	27	’		1000111	107	71	47	G		1100111	147	103	67	g	
0101000	050	40	28	(		1001000	110	72	48	H		1101000	150	104	68	h	
0101001	051	41	29	)		1001001	111	73	49	I		1101001	151	105	69	i	
0101010	052	42	2A	*		1001010	112	74	4A	J		1101010	152	106	6A	j	
0101011	053	43	2B	+		1001011	113	75	4B	K		1101011	153	107	6B	k	
0101100	054	44	2C	,		1001100	114	76	4C	L		1101100	154	108	6C	l	
0101101	055	45	2D	–		1001101	115	77	4D	M		1101101	155	109	6D	m	
0101110	056	46	2E	.		1001110	116	78	4E	N		1101110	156	110	6E	n	
0101111	057	47	2F	/		1001111	117	79	4F	O		1101111	157	111	6F	o	
0110000	060	48	30	0		1010000	120	80	50	P		1110000	160	112	70	p	
0110001	061	49	31	1		1010001	121	81	51	Q		1110001	161	113	71	q	
0110010	062	50	32	2		1010010	122	82	52	R		1110010	162	114	72	r	
0110011	063	51	33	3		1010011	123	83	53	S		1110011	163	115	73	s	
0110100	064	52	34	4		1010100	124	84	54	T		1110100	164	116	74	t	
0110101	065	53	35	5		1010101	125	85	55	U		1110101	165	117	75	u	
0110110	066	54	36	6		1010110	126	86	56	V		1110110	166	118	76	v	
0110111	067	55	37	7		1010111	127	87	57	W		1110111	167	119	77	w	
0111000	070	56	38	8		1011000	130	88	58	X		1111000	170	120	78	x	
0111001	071	57	39	9		1011001	131	89	59	Y		1111001	171	121	79	y	
0111010	072	58	3A	:		1011010	132	90	5A	Z		1111010	172	122	7A	z	
0111011	073	59	3B	;		1011011	133	91	5B	[		1111011	173	123	7B	{	
0111100	074	60	3C	<		1011100	134	92	5C	\		1111100	174	124	7C	|	
0111101	075	61	3D	=		1011101	135	93	5D	]		1111101	175	125	7D	}	
0111110	076	62	3E	>		1011110	136	94	5E	^		1111110	176	126	7E	~	
0111111	077	63	3F	?		1011111	137	95	5F	—		1111111	177	127	7F	Delete	

Plotting the Data

P−Series Plot mode plots the image from the horizontal bit pattern. Figure 4−10 repeats the pattern shown in Figure 4−4 but referenced for odd dot plot. Eight vertical rows are required, two characters per row, six columns per character. The characters required to produce the pattern were found in Table 4−2.

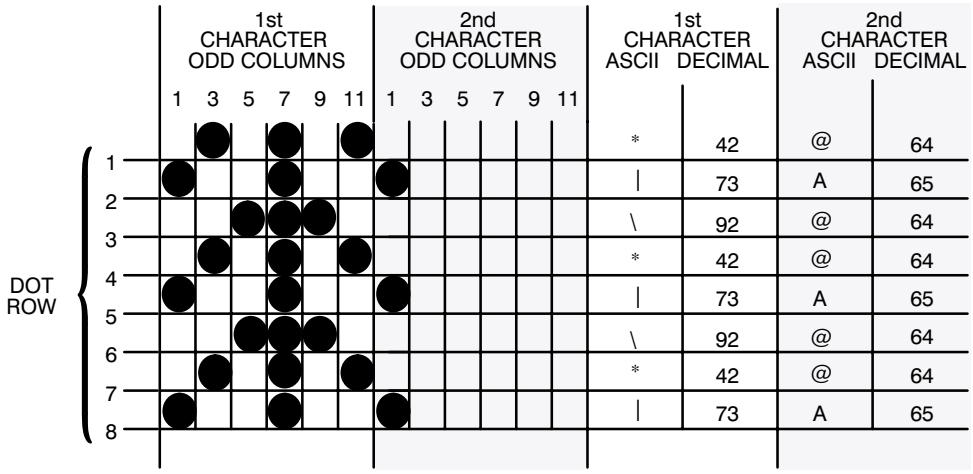


Figure 4−10. Odd Dot Plot Pattern Plan

The following program uses the odd dot plot control code to produce the image. The image is printed 25 times as shown in Figure 4−11. An entire dot row is plotted in one printing pass. Consequently, the first row of all 25 images is printed in one pass, followed by the second row, etc, until all rows have been printed. Notice the difference between the image printed from Bit Image graphics shown in Figure 4−5 and the image printed from odd dot plot shown in Figure 4−11. In the odd dot plot, the second character required to produce the complete image contains blank spaces that cause the apparent gaps between images.

```
10 LPRINT "Odd Dot Plot"
20 FOR I=1 TO 8
30 READ R1
40 READ R2
50 LPRINT CHR$(5);
60 FOR N=1 TO 25
70 LPRINT CHR$(R1);CHR$(R2);
80 NEXT N
90 LPRINT
100 NEXT I
110 DATA 42, 64, 73, 65, 92, 64, 42, 64, 73, 65, 92, 64, 42, 64, 73, 65
120 LPRINT
```

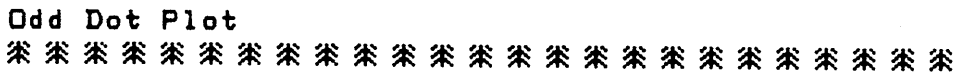


Figure 4−11. Sample Odd Dot Plot

Combining Graphics and Text

P6000L/P6200L Series printers are capable of combining graphics and characters (text) on the same page in two ways: using Bit Image graphics or P−Series Plot mode to produce characters as well as graphics and using a combination of print mode/graphics.

Any character or symbol can be created in the Plot mode or with Bit Image graphics simply by addressing and plotting the appropriate dot positions. In this way, both graphics and text can be produced on the same line in a single printing pass. However, Print mode is a faster, more efficient method of producing characters.

Either Bit Image or Plot mode graphics can be mixed with text within the page on a line by line basis. Each line of graphics data must include a graphics control code or the printer will automatically default to the print mode. Using Bit Image graphics, it is possible to use the print mode to produce text on one print pass followed by a print pass to produce graphics on the same line; however, text characters can be affected by the Bit Image data when combined on the same line.

When returning to the print mode from graphics, an extra line feed should be included in the data stream to maintain proper line registration throughout the page. If the extra line feed is not included, the first character line after the graphics data may be truncated as shown in Figure 4−12.

The MODIFIED PLOT SELECT configuration option, as shown on the Control Panel Switch Function Diagram, sheet 6 of 12 on page 3−22, will affect the translation from graphics to print mode. MODIFIED PLOT DISABLED places the next line of text on the page as if the current line spacing had been followed while plotting. MODIFIED PLOT ENABLED places the next line of text on the dot row following the last dot row of plotting.

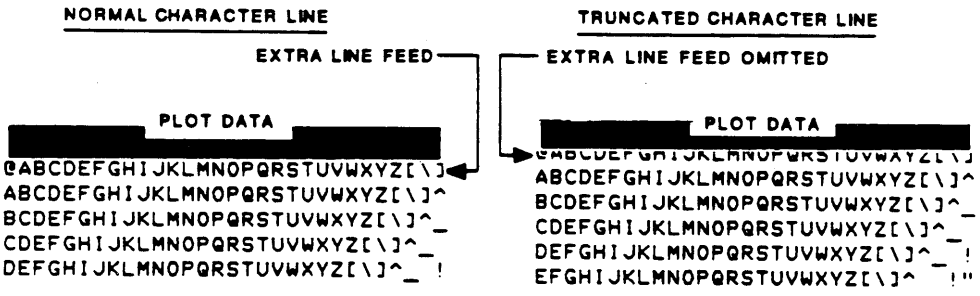


Figure 4−12. Truncated Character Line

CHAPTER 5

VERTICAL FORMAT UNITS

Introduction

P6000L/P6200L Series printers include the *Printronix* standard Electronic Vertical Format Unit (EVFU) for P−Series emulation mode, a Direct Access Vertical Format Unit (DAVFU) if the printer has a Dataproducts interface, and a serial emulation mode Vertical Format Unit (VFU). Each vertical format unit provides an efficient method for fast paper slewing during repetitive printing tasks. The type of VFU used is a configuration option selected from the control panel. This chapter describes:

- DAVFU
- P−Series EVFU
- Serial Emulation VFU

DAVFU

The DAVFU is a feature of P6000L/P6200L Series printers equipped with a Dataproducts interface. The DAVFU permits fast paper slewing within a form of up to 143 lines in length.

A maximum of 12 channels can be assigned to each physical line of a form. Similar to programming a normal EVFU, the user is responsible for assigning channel numbers to each line on the form. Channel codes are then sent by the host computer to the printer resulting in rapid paper slewing to the corresponding line.

General DAVFU Programming

The general DAVFU programming procedure is:

1. Design the form, determining spacing and channel assignments for each line as shown in Figure 5−1.

2. After the form is designed, the programming sequence can be sent to the host. The basic DAVFU sequence is:

   Start Load code, channel assignments per line (requiring two data bytes per line), and the End Load code.

Details of this procedure are described on the following pages.

FORM DATA	FORM LINE #	DAVFU CHANNEL
	1	1 and 12 (Top of Form)
	2	
PART NUMBER	3	2
	4	
PART NAME	5	3 and 8
	6	
QUANTITY	7	4 and 10
	8	
VENDOR	9	5
ADDRESS	10	6
PHONE NUMBER	11	7
	12	

Figure 5−1. Sample DAVFU Form Design

Start Load Code − 6E Hex

The DAVFU Start Load code is 6E (hex) with the Paper Instruction line (PI) high. This initiates the DAVFU memory load routine. Subsequent data received is considered channel assignments until the End Load code is received. The PI line is a hardware interface signal that is held either high or low. Refer to the Interface chapter for PI and Data Line pinout information.

Alternatively, a Start Load Code of 6C or 6D hex may be used in place of 6E hex. When 6C is used as the Start Load Code, line spacing will be 6 lines per minute (lpi). When 6D is used as the Start Load Code, line spacing will be 8 lpi. When the standard 6E is used, line spacing is not changed.

Channel Assignment

Following the Start Load code, all data bytes received are interpreted as channel assignment data until the End Load code is received.

A maximum of 12 channels can be assigned to one physical line on the form. Two eight bit data bytes (DAVFU characters) are required per channel assignment. Lines that have no channel assigned also require two identifying bytes. As shown in Table 5−1, the least significant 6 bits of the first data byte are used to assign channels 1 through 6; the least significant 6 bits of the second data byte are used to assign channels 7 through 12.

Table 5−1. DAVFU Channel Assignment

FIRST DATA BYTE		SECOND DATA BYTE	
BIT #	CHANNEL #	BIT #	CHANNEL #
8	X (don't care)	8	X (don't care)
7	X (don't care)	7	X (don't care)
6	6	6	12
5	5	5	11
4	4	4	10
3	3	3	9
2	2	2	8
1 (LSB)	1	1 (LSB)	7

If a bit is set, the corresponding channel is assigned. If a bit is not set, the channel is not assigned. Consequently, you must be aware of the binary equivalent of the data. For example, assume 41 (hex) and 60 (hex) are the first two data bytes sent following the Start Load code.

41 hex = 01000001 binary

60 hex = 01100000 binary

This sequence results in channel 1 and channel 12 being assigned to line 1 of the form as shown in Table 5−2. No other channels are assigned to line 1.

Each line on the form requires two bytes. For blank lines, the two bytes should not contain channel assignments. That is, the data bytes sent in the load program corresponding to a blank line on the form should not set any of bits 1 through 6.

This procedure can be continued for a maximum of 143 lines (286 DAVFU bytes). The DAVFU ignores anything more than 286 bytes until the End Load code is received; if 572 bytes are received without an End Load code, the End Load code is "forced" and the load routine is terminated.

Table 5−2. Example DAVFU Date Bytes

FIRST DATA (Load) BYTE HEX 41			SECOND DATA (Load) BYTE HEX 60		
BIT #	CHANNEL NUMBER	BINARY VALUE	BIT #	CHANNEL NUMBER	BINARY VALUE
8	X	X	8	X	X
7	X	X	7	X	X
6	6	0	6	12	1 − assign ch 12
5	5	0	5	11	0
4	4	0	4	10	0
3	3	0	3	9	0
2	2	0	2	8	0
1	1	1 − assign ch 1 (TOF)	1	7	0
X = don't care (1 or 0)					

End Load Code − 6F Hex

The DAVFU End Load code is 6F (hex), regardless of the state of the PI line. Before the End Load code is received during the load routine, the state of the PI line is ignored. Sending the End Load code terminates the DAVFU memory load routine.

Using The DAVFU

Once the DAVFU program has been loaded, it can be accessed by sending the appropriate channel instruction to the printer. The paper is slewed to the physical line on the form having the specified channel number assigned in the DAVFU memory. This is accomplished only with the PI line held high. For a data byte to be recognized as a DAVFU channel instruction, the following criteria must be met:

1) PI line must be high
2) Data bit 5 must be 0 (not set)

Given these two conditions, the lower 4 bits of a byte will specify the DAVFU channel number. Table 5−3 lists DAVFU channels and their equivalent data bytes.

Clearing The DAVFU Memory

The following actions will reset (clear) the DAVFU memory.

1. Only Start Load and End Load codes are sent (no channel assignment data).

2. An odd number of DAVFU characters (channel assignment data) are sent and are detected after the End Load code is received. Remember, two data bytes are required per line.

3. A second Start Load code is received, resulting in reinitialization of the DAVFU memory routine. This allows the routine to be restarted.

Table 5−3. DAVFU Channel Instruction

CHANNEL SELECTED	PI LINE	BITS OF DATA BYTE 8	7	6	5	4	3	2	1
1	1	X	X	X	0	0	0	0	0
2	1	X	X	X	0	0	0	0	1
3	1	X	X	X	0	0	0	1	0
4	1	X	X	X	0	0	0	1	1
5	1	X	X	X	0	0	1	0	0
6	1	X	X	X	0	0	1	0	1
7	1	X	X	X	0	0	1	1	0
8	1	X	X	X	0	0	1	1	1
9	1	X	X	X	0	1	0	0	0
10	1	X	X	X	0	1	0	0	1
11	1	X	X	X	0	1	0	1	0
12	1	X	X	X	0	1	0	1	1
X = don't care (1 or 0)									

DAVFU/IGP Execute Form Mode

To use the DAVFU with the IGP−10 or IGP−11 in the Execute Form Mode, it must be loaded while the IGP is in the Execute Form Mode. Consequently, the IGP must create and execute an empty form prior to the DAVFU load routine. A typical procedure follows:

1. Create an empty form using the IGP−10/−11 Special Function Control Character (SFCC) and Create command. Do not create any form elements and do not use the forms length parameter.

2. End the Create Form Mode with the End command.

3. Execute the form using the IGP−10/−11 Special Function Control Character (SFCC) and Execute command. Do not use the form count or page parameters.

4. Enter the DAVFU Start Load code.

5. Enter the DAVFU channel assignments.

6. Enter the DAVFU End Load code.

   NOTE: Refer to the IGP−10/20/40 or IGP−11/21/41 User's Reference Manual for forms creation and execution information

DAVFU Line Slewing

Another method of moving paper using the DAVFU and PI line results in vertical slews of a specified number of lines within the form, rather than slewing to a specific line. For this to occur, two criteria must be met:

1) PI line must be high
2) Data bit 5 must be 1 (set)

If these criteria are met, a specific number of lines will be slewed based on the status of data bits 1−4 as shown in Table 5−4. With bit 5 set and the PI line high, this type of vertical paper motion will occur whether the DAVFU memory is loaded or not.

Table 5−4. DAVFU Vertical Paper Motion By Line Slewing

NUMBER OF LINES SLEWED	PI LINE	BITS OF DATA BYTE 8	7	6	5	4	3	2	1
0	1	X	X	X	1	0	0	0	0
1	1	X	X	X	1	0	0	0	1
2	1	X	X	X	1	0	0	1	0
3	1	X	X	X	1	0	0	1	1
4	1	X	X	X	1	0	1	0	0
5	1	X	X	X	1	0	1	0	1
6	1	X	X	X	1	0	1	1	0
7	1	X	X	X	1	0	1	1	1
8	1	X	X	X	1	1	0	0	0
9	1	X	X	X	1	1	0	0	1
10	1	X	X	X	1	1	0	1	0
11	1	X	X	X	1	1	0	1	1
12	1	X	X	X	1	1	1	0	0
13	1	X	X	X	1	1	1	0	1
14	1	X	X	X	1	1	1	1	0
15	1	X	X	X	1	1	1	1	1

X = don’t care (1 or 0)

P−Series EVFU

The EVFU, a standard feature on all P6000L/P6200L Series printers, is a software controlled vertical formatter. It allows you to preprogram frequently used lines on forms and documents for efficient paper handling in merging operations such as invoicing or payrolling. By flagging each line to be printed, the EVFU automatically slews the paper (rapidly advances the paper) to the identified lines. The EVFU provides 14 channels to identify up to 132 lines. The EVFU also allows you to slew a specific number of lines on the form.

General P−Series EVFU Programming Information

The P−Series EVFU is loaded with a program of line identification codes, one code assigned to each line of the form. To load the memory, the host computer sends the Start Load code, a line identification code (channel code) for each line on the form, and the End Load code. After the memory is loaded, a line identification code occurring in the data stream enables the EVFU to slew the paper to the identified line. The EVFU memory can be cleared by sending just a Start Load code without channel codes or the End Load code.

Apply the following information when programming and using the EVFU.

Printer Operation During EVFU Load − The printer mechanism should not operate during the EVFU memory load routine. If the printer starts to print or if the paper advances, an error may occur in the load program.

Intelligent Graphics Processor − Some operation of the EVFU as described in this section may change when the IGP option is installed. Refer to the IGP−10/20/40 or IGP−11/21/41 User's Reference Manual for operating parameters.

Page Perforation Skip − Loading the EVFU disables the page perforation skip.

Forms Length − Forms of any length, up to 22 inches, can be defined using the EVFU simply by loading the EVFU memory with the desired number of lines on the form. If the printer is set for 6 lpi spacing and a 4−inch high form is to be printed with the EVFU, 24 lines must be loaded in the EVFU memory to establish the proper forms length (4" x 6 lpi = 24 lines). Similarly, if the same form were printed at 8 lpi, 32 lines must be loaded (4" x 8 lpi = 32 lines). If a Start Load code is sent to clear the EVFU memory, the printer then responds to form feed codes by advancing the paper the forms length set by printer configuration.

Line Spacing − The printer can use 6 or 8 lpi spacing with the EVFU. The EVFU calculates the forms length by line density selected. For example, the maximum of 132 lines at 6 lpi yields a 22−inch forms length. The 6 and 8 lpi spacing should not be mixed on the same form. However, if mixed line spacing is unavoidable, the forms length can be calculated as follows.

1. Count the number of lines printed at 6 lpi and divide by 6; the result is in inches.
2. Count the number of lines printed at 8 lpi and divide by 8; the result is in inches.
3. Add the two results; this is the total forms length and should not exceed the maximum allowable forms length which is 22 inches.

Elongated Characters − Elongated characters can be used within EVFU programs. The EVFU automatically counts one line of elongated characters as two character lines.

EVFU Memory Not Loaded − If the EVFU memory is not loaded, the printer will respond to EVFU commands and channel codes sent from the host computer as a single line feed.

Paper Runaway Protection − If the EVFU memory is loaded and a channel code is sent that was not previously loaded, the printer will move the paper a single line feed.

E Display − When the EVFU is enabled, E will be displayed on the control panel.

L Display − When the printer receives a valid load sequence, L will be displayed on the control panel.

Channel Codes − The EVFU memory has the capacity for 132 line forms (22 inches maximum length). The first line identification code (channel code) in the memory load program defines the first line on the form; the second line identification code defines the second line on the form, etc. The line identification codes used depends on the type of interface. No particular sequence is required for the codes but each line must have a line identification code. Filler channel codes are used for lines that will not be accessed by the print program. Any channel code can be used as a filler except channel code 1 which defines the top−of−form. The same filler channel code can be repeated as necessary for any number of lines.

P−Series EVFU Command and Channel Codes

The P−Series EVFU channel and command codes are loaded into the EVFU memory and subsequently activated in one of two ways: by embedded ASCII codes in the data stream (PI line disabled), or with the PI line and decoded interface data lines. Table 5−5 shows the EVFU channel and commands when the PI line is used (enabled); Table 5−6 shows the EVFU channel and commands selected with embedded ASCII codes when the PI line is not used (disabled). The channel and command codes are described as follows.

NOTE: Sensing the PI interface line is configuration controlled.

Table 5−5. P−Series EVFU Codes − PI Line Enabled

ASCII Codes		Parallel Interface	Data Lines							EVFU Code Selected
Hex	**Dec**	**PI**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
00	0	1	X	X	0	0	0	0	0	1 (TOF)
01	1	1	X	X	0	0	0	0	1	2
02	2	1	X	X	0	0	0	1	0	3
03	3	1	X	X	0	0	0	1	1	4
04	4	1	X	X	0	0	1	0	0	5
05	5	1	X	X	0	0	1	0	1	6
06	6	1	X	X	0	0	1	1	0	7
07	7	1	X	X	0	0	1	1	1	8
08	8	1	X	X	0	1	0	0	0	9
09	9	1	X	X	0	1	0	0	1	10
0A	10	1	X	X	0	1	0	1	0	11
0B	11	1	X	X	0	1	0	1	1	12 (VT)
0C	12	1	X	X	0	1	1	0	0	13
0D	13	1	X	X	0	1	1	0	1	14
0E	14	1	X	X	0	1	1	0	0	15
0F	15	1	X	X	0	1	1	0	1	16
6E	110	1	1	1	0	1	1	1	0	Start Load
6F	111	1	1	1	0	1	1	1	1	End Load
X = Undefined, 0 or 1						1 = True				0 = False

Table 5−6. P−Series EVFU Codes − PI Line Disabled

ASCII Codes		Parallel Interface	Data Lines						EVFU Code Selected
Hex	**Dec**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
10	16	X	X	1	0	0	0	0	1 (TOF)
11	17	X	X	1	0	0	0	1	2
12	18	X	X	1	0	0	1	0	3
13	19	X	X	1	0	0	1	1	4
14	20	X	X	1	0	1	0	0	5
15	21	X	X	1	0	1	0	1	6
16	22	X	X	1	0	1	1	0	7
17	23	X	X	1	0	1	1	1	8
18	24	X	X	1	1	0	0	0	9
19	25	X	X	1	1	0	0	1	10
1A	26	X	X	1	1	0	1	0	11
1B	27	X	X	1	1	0	1	1	12 (VT)
1C	28	X	X	1	1	1	0	0	13
1D	29	X	X	1	1	1	0	1	14
1E	30	0	0	1	1	1	1	0	Start Load
1F	31	0	0	1	1	1	1	1	End Load
X = Undefined, 0 or 1					1 = True				0 = False

Start Load − Clears and initializes the EVFU memory for the memory load program. The Start Load code is 1E hex when the PI line is not used or 6E hex when the PI line is used.

End Load − Terminates the memory load program. The End Load code is 1F hex when the PI line is not used or 6F hex when the PI line is used.

Channel 1 − The top−of−form code, reserved as the first line on the form or the first line printed (top−of−form position). The operating program sends the channel 1 code to advance to the top of the next form.

Channels 2 through 11, 13 and 14 − Used as general channel codes, line identification codes, or filler channels. Each line on the form must be identified by a channel code. When the operating program sends the channel code, the paper advances to the line identified by the channel code. Filler channels are used to identify lines that will never be accessed by the operating program.

Channel 12 − Reserved as the Vertical Tab channel. The Vertical Tab code (VT, 0B hex) prints any data in the print buffer and rapidly slews the paper to the next line identified by the channel 12 code. If channel 12 is not loaded in the EVFU memory, a single line feed will be executed when a VT code is sent.

Form Feed − A Form Feed code (0C hex) advances the paper to the next top−of−form position.

P−Series EVFU Form Definition Program

The P−Series EVFU form definition program (memory load program) is sent to the printer from the host computer to assign channel codes to the lines of a form. The channel codes are later accessed by the operating program to print specific data at the lines identified by the codes. A sample EVFU form definition program is shown in Figure 5−2.

FORM DATA	FORM LINE NUMBER	EVFU LOAD PROGRAM	HEX CODE PI LINE DISABLED
		START LOAD	1E
	1	CH2	11
	2	CH2	11
NAME Joe Jacob Doe	3	CH1	10
	4	CH2	11
AGE 45	5	CH3	12
	6	CH2	11
	7	CH2	11
DEPARTMENT Accounting	8	CH4	13
TITLE Manager	9	CH5	14
	10	CH2	11
	11	CH2	11
	12	CH2	11
ADDRESS Station E5	13	CH14	1D
	14	CH2	11
	15	CH2	11
NUMBER 1759386	16	CH9	18
	17	CH2	11
	18	CH2	11
DATE 02/06/64	19	CH12	1B
	20	CH2	11
		END LOAD	1F

Figure 5−2. Sample P−Series EVFU Form Definition Program

The format for the form definition program sent from the host computer is as follows.

1. EVFU Start Load code.

2. The channel 2 code is sent two times to define the first two lines of the form as fillers. Alternatively, the channel 1 code, top−of−form, could have been the first code sent to define the first line of the form as the top−of−form position.

3. The channel 1 code is sent to assign the top−of−form position to the first line printed on the form, rather than using the top−of−form code to define the first line on the form.

4. A series of channel codes are sent, one for each line of the form. If the form is 25 lines long, 25 channel codes must be sent. Each line to be accessed for printing by the operating program should have a unique channel code. Lines not to be accessed for printing by the operating program should have a filler channel code assigned. One filler channel code can be used for all “blank” lines of the form.

5. EVFU End Load code.

The top−of−form code can be used to identify the first line of the form, whether or not it is the first line printed, or it can be used to identify the first line printed. In this example, the top−of−form code, channel 1, is used as the line identification code of the first line to be printed, not the first line of the form. In the case shown by the example, a Form Feed code, pushing the TOF switch on the control panel, or sending the channel 1 code will slew paper to line 3 of the form.

To avoid confusion, it is best to assign unique channel numbers to each line printed. If you have an exceptionally long form with a large amount of lines, one channel code can define more than one line. In Figure 5−1 for example, both line 5 and line 8 of the form could have been assigned channel 4. When the host computer sends the channel 4 code the first time, the EVFU slews the paper to line 5 and prints the AGE data. When the host computer sends channel 4 the second time, the EVFU slews the paper to line 8 and prints the DEPARTMENT data. (If a third line was defined by channel code 4, that line would be accessed by the next occurrence of channel code 4 in the data stream, etc. Otherwise, the next occurrence of channel code 4 in the data stream would cause the EVFU to slew paper to the first line identified by channel 4 on the next form.) This procedure allows a single channel code to define more than one line on the form, but you must be aware of which line of the form is being accessed by the number of occurrences of the channel code in the data stream.

In the example shown in Figure 5−2, channel 2 is used repeatedly as the filler channel. The print program would not send the channel 2 code. The lines identified by channel 2 are always blank.

Table 5−7 defines the functions of the EVFU channels used in the Figure 5−2 example.

Table 5−7. Example P−Series EVFU Channel Functions

FORM LINE #	EVFU CH.	FUNCTION
N/A	Start Load	Resets EVFU memory, begins load program, sets forms length to default.
1	ch 2	Any EVFU channel can be used as a filler (except ch 1 & 12). In this example, ch 2 is used as the filler.
2	ch 2	Defines this line as a filler.
3	ch 1	In this example, the first line printed is assigned the TOF channel code. This code is normally used once per form at either the first print line or the first line of the form. A FF (form feed code), pressing TOF, or sending ch 1 slews the paper to this line.
4	ch 4	Defines this line as a filler.
5	ch 3	Defines line 5 to be printed with AGE data.
6	ch 2	Defines this line as a filler.
7	ch 2	Defines this line as a filler.
8	ch 4	Defines line 8 to be printed with DEPARTMENT data.
9	ch 5	Defines line 9 to be printed with TITLE data.
10	ch 2	Defines this line as a filler.
11	ch 2	Defines this line as a filler.
12	ch 2	Defines this line as a filler.
13	ch 14	Defines line 13 to be printed with ADDRESS data.
14	ch 2	Defines this line as a filler.
15	ch 2	Defines this line as a filler.
16	ch 9	Defines line 16 to be printed with NUMBER data.
17	ch 2	Defines this line as a filler.
18	ch 2	Defines this line as a filler.
19	ch 12	Channel 12, Vertical Tab, defines line 19 to be printed with DATE data. Each time a VT code or ch 12 is sent, the paper is slewed to this position.
20	ch 2	Defines this line as a filler.
N/A	End Load	Terminates the memory load routine.

P−Series EVFU Line Slewing

The P−Series EVFU can also be used to slew a specified number of lines rather than slewing to a specific line. The PI line must be enabled and set true as well as data bit 5 true to slew a number of lines. With the PI line true and data bit 5 true, the binary count of interface lines 1 through 4 determine the number of lines slewed as described in Table 5−8. Note that state of data bit 5 is the difference between line slewing and using the interface lines as EVFU channel codes; for line slewing, data bit 5 must be true but for EVFU channel codes under interface control, data bit 5 must be false.

NOTE: If the printer is configured for the DAVFU, the binary count for line slew produces a 0 − 15 line slew rather than 1 − 16 as shown in the table for the EVFU. The 1 − 16 (EVFU) or 0 − 15 (DAVFU) binary count line slew is determined based on if the EVFU or the DAVFU is currently enabled or last enabled.

NOTE: The # of lines slewed in the P−Series EVFU may be configured via the front panel for 1−16 or 1−15 lines.

Table 5−8. P−Series EVFU Line Slewing

DATA LINES									# OF LINES SLEWED	
PI	7	6	5	4	3	2	1		1 − 16	1 − 15
1	X	X	1	0	0	0	0		1	1
1	X	X	1	0	0	0	1		2	1
1	X	X	1	0	0	1	0		3	2
1	X	X	1	0	0	1	1		4	3
1	X	X	1	0	1	0	0		5	4
1	X	X	1	0	1	0	1		6	5
1	X	X	1	0	1	1	0		7	6
1	X	X	1	0	1	1	1		8	7
1	X	X	1	1	0	0	0		9	8
1	X	X	1	1	0	0	1		10	9
1	X	X	1	1	0	1	0		11	10
1	X	X	1	1	0	1	1		12	11
1	X	X	1	1	1	0	0		13	12
1	X	X	1	1	1	0	1		14	13
1	X	X	1	1	1	1	0		15	14
1	X	X	1	1	1	1	1		16	15

X = undefined, either 1 or 0
1 = true
0 = false

Serial Emulation VFU

In the Serial Matrix emulation mode, the VFU is basically a set of preprogrammed vertical tabs. Various lines of the form are assigned vertical tabs which are then accessed by control code for rapid paper advancement to the tab position. Additionally, one form can be assigned various channels and each channel can be assigned different tab positions. This allows various formats to be set, stored, and called as needed. Four control codes are used for the Serial mode VFU: ESC / for channel selection, ESC b for tab setting by channel, ESC B for single channel tab setting, and VT to execute a vertical tab. These codes and the parameters surrounding their use are described in the Programming chapter.

Executing Vertical Tabs

The vertical tab execute code is VT. When sent, it prints the contents of the print buffer (if data is in the buffer) and causes paper movement to the next predefined vertical tab position. If a tab position is not defined, the paper is moved to the next line at the current line spacing. If a tab position is at the current line, the paper is moved to the next tab position. If no tab positions are defined between the current line and the end of the form, the paper moves to the next TOF.

Vertical Tab Positions

Vertical tab positions are set by line number. A maximum of 16 vertical tab positions can be set per channel of the form. If the single channel format is used, a maximum of 16 vertical tabs can be set for the form. A sample single channel format is shown in Figure 5−3. The first vertical tab is set at line 6 for part number data, a second tab is set at line 8 for part name data, and a third tab is set at line 14 for quantity data. Since this is a single channel format, the ESC B code can be used to assign the vertical tabs to the lines of the form. Once the tab positions are set, sending the vertical tab execute code (VT) causes the paper (currently at the top−of−form position) to advance to the first tab position for PART NUMBER data. Sending another VT moves the paper to the second tab position for the PART NAME, followed by a third VT to access the third tab position for the QUANTITY data.

FORM DATA	FORM LINE NUMBER	VERTICAL TABS
	1	Top of Form
	2	
	3	
	4	
	5	
PART NUMBER	6	Tab 1
	7	
PART NAME	8	Tab 2
	9	
	10	
	11	
	12	
	13	
QUANTITY	14	Tab 3
	15	
	16	
	17	
	18	
	19	
	20	

Figure 5−3. Sample Serial Matrix Vertical Tab Positions

CHAPTER 6

PROGRAMMING

Introduction

The P6000L/P6200L printers can be configured by the user from the control panel to respond to *Printronix* P−Series or IBM Graphics Printer Serial Matrix control codes. This dual compatibility allows the programmer to choose one of two standard protocols. If equipped with the Intelligent Graphics Processor (IGP) option, the printer will respond to the Special Function Control Character and IGP commands as described in the IGP User's Reference Manual. This chapter describes:

- Overstrike Mode
- Control Code Functions
- Special Function Code − Control Code Header
- Attribute Set and Reset Codes
- Control Code Reference Index
- Individual Control Code descriptions

Overstrike Mode

Data in the print buffer can be underlined or overstruck when the carriage return code (hex 0D) is configured for carriage return only (not carriage return and line feed). Any printable character in the data stream can overstrike printable characters or spaces already loaded in the print buffer as long as a paper motion command (ie: line feed, form feed) has not been received. An example of overstriking and underlining characters is shown in Figure 6−1.

Enter in Print Buffer	**Printed Result**
P6000 SERIES PRINTER (CR) [SP][SP]/// (CR) _____(LF)	P6000 SERIES PRINTER

Key [Sp] = Space (20 Hex) CR = Carriage Return (0D Hex)*
LF = Line Feed (0A Hex) _ = Underline (5F Hex)

** NOTE: The printer must be configured for carriage return only. If configured for a carriage return and line feed on receipt of the CR code, the contents of the buffer will be printed.*

Figure 6−1. Overstrike/Underlining Example

Control Code Functions

The following information is listed for each code function (where applicable and possible).

ASCII Mnemonic − The standard ASCII name for the control code.

Hex Code − The code's numeric equivalent in hexadecimal.

Purpose − The function(s) of the control code.

Expression − A sample program statement written in the BASIC programming language.

Comment − A description of exceptions or limitations to normal use.

Special Function Code − Control Code Header

A Special Function Code (SFC) is used to extend the control code protocol. The SFC is the control code introducer (or header); it is the first input in the sequence of parameters. The general control code sequence is:

(SFC)(parameter 1)(parameter 2)...(parameter n)

P−Series codes use SOH as the control code introducer. For example, to enable bold print in the P−Series mode, use the P−Series SFC and the bold print control code character G:

ASCII: SOH G **Hex:** 01 47 **BASIC:** CHR$(1);″G″

Similarly, Serial Matrix codes use ESC as the control code introducer. For example, to enable bold print in the Serial Matrix mode, use the Serial Matrix SFC and the bold print control code character G:

ASCII: ESC G **Hex:** 1B 47 **BASIC:** CHR$(27);″G″

NOTE: All ESC and SOH commands must be terminated by a ";" in a BASIC program or by text following the command string. A paper motion command directly following a special function code command may result in erroneous paper movement.

Attribute Set and Reset Codes

Certain print attributes are set and reset (turned on or off) by using the appropriate ESC or SOH code sequence and the numbers 1 or 0. These may be either the hexadecimal code 01 and 00, or the ASCII code for the printable symbols of decimal 1 and 0 (hexadecimal code 31 and 30, respectively). Expanded Print, Super/Subscript Print, and Underline are attributes which are set/reset in this fashion.

Control Code Reference Index

The following index lists the control codes by function and lists the ASCII mnemonic and page number. Alphabetical listings by mnemonic and function are provided in Appendix D.

NOTE: Functions marked with a † are available using another control code sequence or control panel selections.

PAPER MOTION

FUNCTION	P−SERIES	PRINTRONIX MATRIX (IBM Graphics Printer)	SERIAL	PAGE NO.
Form Feed		FF	FF	6−27
Line Feed		LF	LF	6−33
Line Feed n/216 Inch		N/A	ESC J	6−34
Vertical Tab	VT	VT	6−57	

FORMAT

FUNCTION	P−SERIES	PRINTRONIX MATRIX (IBM Graphics Printer)	SERIAL	PAGE NO.
Backspace		N/A	BS	6−5
Cancel		N/A	CAN	6−13
Carriage Return		CR	CR	6−14
EVFU Commands		DLE−US	N/A	6−22
Forms Length Set (Inches)		N/A †	ESC C NUL	6−28
Forms Length Set (Lines)		N/A †	ESC C	6−29
Horizontal Tab		N/A	HT	6−30
Horizontal Tab Set		N/A	ESC D	6−31
Line Spacing 1/6 Inch (6 lpi)		SOH 2	N/A	6−35
Line Spacing 1/8 Inch (8 lpi)		SOH 0	ESC 0	6−36
Line Spacing 8 LPI (1 line only)		ACK	N/A †	6−37
Line Spacing 7/72 Inch		N/A	ESC 1	6−38
Line Spacing n/72 Inch (stored) (as asserted by ESC 2)		N/A	ESC A	6−40
Line Spacing n/72 Inch (asserted) (as stored by ESC A)		N/A	ESC 2	6−39
Line Spacing n/216 Inch	N/A	ESC 3	6−41	
Skip−Over Perforation		N/A †	ESC N	6−52
Skip−Over Perforation Cancel		N/A †	ESC O	6−53
Vertical Tab Set		N/A	ESC B	6−58
Bold Print		SOH G	ESC G	6−11
Bold Print Reset		SOH H	ESC H	6−12
Condensed Print		N/A †	SI (or ESC SI)	6−17
Condensed Print Reset		N/A †	DC2	6−18

PRINT MODE (Continued)

		PRINTRONIX	SERIAL	

FUNCTION	P−SERIES	MATRIX	PAGE NO.
		(IBM Graphics Printer)	
Elongated (Double High) Print (1 line)		SOH d or BS	ESC d	6−19
Emphasized Print		SOH E	ESC E	6−20
Emphasized Print Reset		SOH F	ESC F	6−21
Expanded (Double Wide) Print		SOH W	ESC W	6−23
Expanded (Double Wide) Print Reset		SOH W	DC4 (or ESC W)	6−23
Expanded (Double Wide) Print (1 line)		N/A	SO (or ESC SO)	6−24
Overscoring		SOH _	ESC _	6−42
Print Mode/Pitch Selection		SOH X	ESC X	6−48
Superscript/Subscript Printing		SOH S	ESC S	6−54
Superscript/Subscript Printing Reset		SOH T	ESC T	6−55
Underline		SOH −	ESC −	6−56

GRAPHICS

FUNCTION	P−SERIES	PRINTRONIX MATRIX	SERIAL PAGE NO.
		(IBM Graphics Printer)	
Bit Image Mode, Double Density		N/A	ESC L	6−8
Bit Image Mode, Double Density/Speed		N/A	ESC Y	6−9
Bit Image Mode, Quadruple Density		N/A	ESC Z	6−10
Bit Image Mode, Single Density		N/A	ESC K	6−7
Plot, Even Dot (High Density)		EOT	EOT	6−43
Plot, Odd Dot		ENQ	ENQ	6−44

OTHER FUNCTIONS

FUNCTION	P−SERIES	PRINTRONIX MATRIX	SERIAL PAGE NO.
		(IBM Graphics Printer)	
Bell		BEL	BEL	6−6
Extended Character Set	SO	ESC 4	6−25	
Extended Character Set Cancel		SI	ESC 5	6−26
International Character Select		SOH R	ESC R	6−32
Printer Reset		SOH @	ESC @	6−46
Printer Select		N/A	DC1	6−47
Printer Deselect		N/A	DC3	6−45
Character Set Select (Control Codes)		SOH 7	ESC 7	6−15
Character Set Select (Printable Symbols)		SOH 6	ESC 6	6−16
RibbonMinder		SOH r	ESC r	6−49
RibbonMinder (through page)				6−51

Backspace

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	BS
Hex Code:	N/A	08
Purpose:	Moves the logical print head leftward one character space toward the first character column.	
Expression:	N/A	CHR$(8);
Comment:	Moves the character position indicator (the logical print head position) one character space to the left at the current character pitch setting. The code is ignored if the logical print head is positioned at the first character column. When the backspace code is received, printing speed for the print line is reduced to half.	
Example:	Print and backspace two character positions.	

```
10 LPRINT "TTTTT";
20 LPRINT CHR$(8);CHR$(8);
30 LPRINT "=="
```

```
TTT==
```

Bell

	P−SERIES	SERIAL MATRIX
ASCII Code:	BEL	BEL
Hex Code:	07	07
Purpose:	Sounds a buzzer/beeper.	
Expression:	CHR$(7);	CHR$(7);
Comment:	If the printer is equipped, the BEL function will sound a buzzer/beeper for 0.2 seconds upon receipt of this command.	

Bit Image Mode, Single Density

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	ESC K
Hex Code:	N/A	1B 4B

Purpose: Selects Single (Normal) Density Bit Image graphics.

Expression: CHR$(27);″K″;CHR$(n1);CHR$(n2);″DATA″

where: n1 + 256 n2 define the number of data bytes to follow.
DATA = ASCII characters for the dot pattern bytes.

NOTE: The DATA can be expressed in a CHR$(DATA) format with the appropriate decimal values of the ASCII characters supplied especially in cases where the dot patterns of nonprintable characters are required.

Comment: For detailed information, refer to the Bit Image section in the Graphics chapter.

Example: The following example produces a pattern of Single Density Bit Image graphics. The 7 data bit pattern is repeated 40 times. Compare this example to the double density and quadruple density examples.

NOTE: Depending on the host computer system, it may be necessary to include a width statement within the BASIC program.

```
10 WIDTH "lpt1:",255
20 LPRINT "Single Density Bit Image Graphics"
30 LPRINT CHR$(27);"K";CHR$(244);CHR$(0);
40 FOR N=1 TO 27
50 RESTORE
60 FOR I=1 TO 9
70 READ R
80 LPRINT CHR$(R);
90 NEXT I
100 NEXT N
110 LPRINT CHR$(255)
120 DATA 255,128,64,32,16,8,4,2,1
```

```
Single Density Bit Image Graphics
```

Bit Image Mode, Double Density

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	ESC L
Hex Code:	N/A	1B 4C

Purpose: Selects Double Density Bit Image graphics.

Expression: CHR$(27);″L″;CHR$(n1);CHR$(n2);″DATA″

where: n1 + 256 n2 define the number of data bytes to follow.
DATA = ASCII characters for the dot pattern bytes.

NOTE: The DATA can be expressed in a CHR$(DATA) format with the appropriate decimal values of the ASCII characters supplied especially in cases where the dot patterns of nonprintable characters are required.

Comment: For detailed information, refer to the Bit Image section in the Graphics chapter.

Example: The following example produces Double Density Bit Image graphics of the pattern used in the Single Density Bit Image Mode example. Note that the amount of data must be doubled for double density (the data is used 80 times rather than 40).

NOTE: Depending on the host computer system, it may be necessary to include a width statement within the BASIC program.

```
10 WIDTH "lpt1:",255
20 LPRINT "Double Density Bit Image Graphics"
30 LPRINT CHR$(27);"L";CHR$(231);CHR$(1);
40 FOR N=1 TO 54
50 RESTORE
60 FOR I=1 TO 9
70 READ R
80 LPRINT CHR$(R);
90 NEXT I
100 NEXT N
110 LPRINT CHR$(255)
120 DATA 255,128,64,32,16,8,4,2,1
```

```
Double Density Bit Image Graphics
NNNN
```

Bit Image Mode, Double Density Double Speed

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	ESC Y
Hex Code:	N/A	1B 59

Purpose: Prints graphics at twice the speed of Double Density (same speed as Single Density) by ignoring adjacent dots.

Expression: CHR$(27);″Y″;CHR$(n1);CHR$(n2);″DATA″

where: n1 + 256 n2 define the number of data bytes to follow.
DATA = ASCII characters for the dot pattern bytes.

NOTE: The DATA can be expressed in a CHR$(DATA) format with the appropriate decimal values of the ASCII characters supplied especially in cases where the dot patterns of nonprintable characters are required.

Comment: For detailed information, refer to the Bit Image section in the Graphics chapter.

Example: The following example produces Double Density Double Speed Bit Image graphics of the pattern used in the Single Density Bit Image Mode example. Note that the amount of data must be doubled for double density (the data is used 80 times rather than 40).

NOTE: Depending on the host computer system, it may be necessary to include a width statement within the BASIC program.

```
10 WIDTH "lpt1:",255
20 LPRINT "Double Density Double Speed Bit Image Graphics"
30 LPRINT CHR$(27);"Y";CHR$(231);CHR$(1);
40 FOR N=1 TO 54
50 RESTORE
60 FOR I=1 TO 9
70 READ R
80 LPRINT CHR$(R);
90 NEXT I
100 NEXT N
110 LPRINT CHR$(255)
120 DATA 255,128,64,32,16,8,4,2,1
```

```
Double Density Double Speed Bit Image Graphics
NNNN
```

Bit Image Mode, Quadruple Density

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	ESC Z
Hex Code:	N/A	1B 5A

Purpose: Selects Quadruple Density Bit Image graphics.

Expression: CHR$(27);″Z″;CHR$(n1);CHR$(n2);″DATA″

where: n1 + 256 n2 define the number of data bytes to follow.
DATA = ASCII characters for the dot pattern bytes.

NOTE: The DATA can be expressed in a CHR$(DATA) format with the appropriate decimal values of the ASCII characters supplied especially in cases where the dot patterns of nonprintable characters are required.

Comment: In Quadruple Density, the data that follows n1 and n2 is paired, and the resultant data is treated as in Bit Image mode, Double Density. The values of n1 and n2 must be properly defined as described in the Bit Image section of the Graphics chapter. The maximum number of data per line is 3168 in the Data Processing and High Speed print modes, and 4752 in the Correspondence print mode.

The printed density in this mode is 120 dpi horizontal and 72 dpi vertical when selected from the Data Processing print mode, 180 dpi horizontal and 96 dpi vertical when selected from the Correspondence print mode, or 120 dpi horizontal and 48 dpi vertical when selected from the High Speed print mode.

Example: The following example produces quadruple density graphics of the pattern shown in the Bit Image section of the Graphics chapter. This is the same example as in the Single Density Bit Image Mode example, except the amount of data must be quadrupled for quadruple density (the data is used 160 times rather than 40).

NOTE: Depending on the host computer system, it may be necessary to include a width statement within the BASIC program.

```
10 WIDTH "lpt1:",255
20 LPRINT "Quad Density Bit Image Graphics"
30 LPRINT CHR$(27);"Z";CHR$(205);CHR$(3);
40 FOR N=1 TO 108
50 RESTORE
60 FOR I=1 TO 9
70 READ R
80 LPRINT CHR$(R);
90 NEXT I
100 NEXT N
110 LPRINT CHR$(255)
120 DATA 255,128,64,32,16,8,4,2,1
```

```
Quad Density Bit Image Graphics
```

Bold Print

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH G	ESC G
Hex Code:	01 47	1B 47
Purpose:	Selects bold character printing.	
Expression:	CHR$(1);″G″ ;	CHR$(27);″G″ ;
Comment:	When the bold character printing control code is received, all characters are printed in bold until reset by the bold print reset control code or printer reset. Bold Print is the same as printing double strike. Bold character printing reduces print speed to half. Superscript or subscript characters on the same line will cause the bold function to be implemented by a vertical “shadow” rather than a double strike. In this case, many symbols are difficult to read. Bold attribute is not recommended for use on lines containing superscript or subscript.	
Example:	The following sample program illustrates bold character printing set and reset.	

```
10 LPRINT "Control code ESC G"
20 LPRINT CHR$(27);"G";
30 LPRINT "selects bold character printing,"
40 LPRINT "for example: AaBbCcDdEeFfGgHhIiJjKkLlMmNnOoPp."
50 LPRINT "Control code ESC H"
60 LPRINT CHR$(27);"H";
70 LPRINT "cancels bold character printing."
```

```
Control code ESC G
selects bold character printing,
for example: AaBbCcDdEeFfGgHhIiJjKkLlMmNnOoPp.
Control code ESC H
cancels bold character printing.
```

Bold Print Reset

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH H	ESC H
Hex Code:	01 48	1B 48
Purpose:	Resets bold character printing.	
Expression:	CHR$(1);″H″;	CHR$(27);″H″;
Comment:	The bold print reset control code only resets the bold print character attribute. Other print attributes such as double wide printing are not affected.	
Example:	Refer to the Bold Print control code for a sample program of bold character printing set and reset.	

Cancel

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	CAN
Hex Code:	N/A	18
Purpose:	Clears the print buffer of all printable symbols since the last paper motion command was received.	
Expression:	N/A	CHR$(24);
Comment:	This control code may be used as a “delete line” function but should be used with extreme care to avoid possible misprinting. This control code will cancel the double wide attribute set by SO, if active. No other print attributes are affected.	

Carriage Return

	P−SERIES	SERIAL MATRIX
ASCII Code:	CR	CR
Hex Code:	0D	0D
Purpose:	Returns the logical print head to the first character column (resets the pointer to the first character position).	
Expression:	CHR$(13);	CHR$(13);
Comment:	The CR code may or may not cause printing or paper motion, depending on the DEFINE CR CODE configuration parameter value. If the DEFINE CR CODE submenu displays: DEFINE CR CODE CR=CR the characters following the CR are printed over the previous characters on the line. If identical characters are placed in the same position on the line, those characters will be printed in bold (double strike) print. The CR=CR configuration causes subsequent printable data to overprint previous data at half speed unless an intervening paper motion command is received. If the DEFINE CR CODE submenu displays: DEFINE CR CODE CR=LF+CR control code CR is converted to perform a carriage return and line feed function. The CR code in the Serial Matrix mode cancels expanded (double wide) print when set by code SO or ESC SO (single line printing attribute).	

Character Set Select (Control Codes)

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH 7	ESC 7
Hex Code:	01 37	1B 37
Purpose:	Selects the character set wherein hex codes 80 to 9F are control codes.	
Expression:	CHR$(1);″7″;	CHR$(27);″7″;
Comment:	Refer to Character Sets #1 and #3 in Appendix B for the control codes in Serial Matrix and P−Series, respectively.	

Character Set Select (Printable Symbols)

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH 6	ESC 6
Hex Code:	01 36	1B 36
Purpose:	Selects the character set wherein hex codes 80 to 9F are printable symbols.	
Expression:	CHR$(1);″6″;	CHR$(27);″6″;
Comment:	Refer to Character Sets #2 and #4 in Appendix B for the printable symbols in Serial Matrix and P−Series, respectively.	

Condensed Print

	P−SERIES	SERIAL MATRIX
ASCII Code:	See Comment	SI
Hex Code:		0F
Purpose:	Selects 17 characters per inch (cpi) condensed print format.	
Expression:	N/A	CHR$(15);
Comment:	P−Series control code SOH X can be used to select condensed print. The Serial Matrix condensed print control code (SI) affects all subsequent characters. After receiving code SI, all characters will be printed in condensed print until reset by the condensed print reset control code, printer reset, or a new print mode control code. The Serial Matrix SI code (hex 0F) is equivalent to the ESC SI code. If condensed print is not allowed in the current print mode, the code is ignored. Also, Serial Matrix control code ESC X can be used to select condensed print.	
Example:	The following sample program illustrates condensed character printing set and reset.	

```
10 LPRINT "Control code"
20 LPRINT "SI selects"
30 LPRINT CHR$(15);
40 LPRINT "condensed character printing."
50 LPRINT "Control code DC2"
60 LPRINT CHR$(18);
70 LPRINT "resets condensed character printing."
```

```
Control code
SI selects
condensed character printing.
Control code DC2
resets condensed character printing.
```

Condensed Print Reset

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	DC2
Hex Code:	N/A	12
Purpose:	Resets condensed character printing to 10 cpi.	
Expression:	N/A	CHR$(18);
Comment:	The condensed print reset control code selects 10 cpi pitch. Other print attributes are not affected.	
Example:	Refer to the Condensed Print control code for a sample program of condensed character set and reset.	

Elongated (Double High) Print

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH d or BS	ESC d
Hex Code:	01 64 or 08	1B 64
Purpose:	Selects elongated (double high) character printing for one line only. Elongated characters are approximately double height but standard width.	
Expression: **or:**	CHR$(1);″d″; CHR$(8);	CHR$(27);″d″;
Comment:	The elongated character control code is a line−by−line print attribute; when the control code is received, one entire line of elongated characters is printed and then automatically reset. Elongated characters are formed by printing twice the number of dot rows, except the top and bottom rows are not duplicated in P−Series printer protocol. P−Series control code BS (Hex 08) also selects elongated character printing for a single line.	
Example:	The following sample program illustrates elongated character printing.	

```
10 LPRINT "Control code"
20 LPRINT "ESC d selects"
30 LPRINT CHR$(27);"d";
40 LPRINT "elongated character printing"
50 LPRINT "for one line only."
```

```
Control code
ESC d selects
elongated character printing
for one line only.
```

Emphasized Print

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH E	ESC E
Hex Code:	01 45	1B 45
Purpose:	Selects emphasized character print format.	
Expression:	CHR$(1);″E″;	CHR$(27);″E″;
Comment:	When the emphasized print control code is received, all characters will be printed in emphasized print until reset by the emphasized print reset control code or printer reset. The emphasized print attribute is implemented by horizontal “shadow” printing and reduces the print speed to half. Superscript and subscript characters, as well as 15 and 17 cpi characters will not print in emphasized type.	
Example:	The following sample program illustrates emphasized character printing set and reset.	

```
10 LPRINT "Control code"
20 LPRINT "ESC E selects"
30 LPRINT CHR$(27);"E";
40 LPRINT "emphasized character printing ";
50 LPRINT CHR$(27);"F";
60 LPRINT "cancels emphasized character printing."
```

```
Control code
ESC E selects
emphasized character printing cancels emphasized character printing.
```

Emphasized Print Reset

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH F	ESC F
Hex Code:	01 46	1B 46
Purpose:	Resets emphasized character printing.	
Expression:	CHR$(1);″F″;	CHR$(27);″F″;
Comment:	The emphasized print reset control code only resets the emphasized print character attribute.	
Example:	Refer to the Emphasized Print control code for a sample program of emphasized printing set and reset.	

EVFU Commands (P−Series)

	P−SERIES	SERIAL MATRIX
ASCII Code:	DLE to US	N/A
Hex Code:	10 to 1F	N/A
Purpose:	Load and execute the EVFU.	
Expression:	CHR$(16); to CHR$(31);	
Comment:	In the P−Series mode, these commands are the EVFU channel 1 to 14, start load and end load commands, respectively. Refer to the Vertical Format Units chapter for details.	

Expanded (Double Wide) Print

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH W n	ESC W n
Hex Code:	01 57 n	1B 57 n
Purpose:	Selects or resets expanded (double wide) print.	
Expression:	CHR$(1);″W″;CHR$(n);	CHR$(27);″W″;CHR$(n);
where:	n = 1 selects expanded print (hex 01 or hex 31) n = 0 resets expanded print (hex 00 or hex 30)	
Comment:	When the expanded print control code is received, all characters will be printed double wide until reset by the expanded print reset control code, DC4 (Serial Matrix only) or printer reset. Also refer to Serial Matrix control code SO and ESC SO.	
Example:	The following sample program illustrates expanded character printing set and reset.	

```
10 LPRINT "Control code"
20 LPRINT "ESC W 1 selects"
30 LPRINT CHR$(27);"W";CHR$(1);
40 LPRINT "expanded character printing."
50 LPRINT "Control code"
60 LPRINT "ESC W 0 resets"
70 LPRINT CHR$(27);"W";CHR$(0);
80 LPRINT "expanded character printing."
```

```
Control code
ESC W 1 selects
expanded character printing.
Control code
ESC W 0 resets
expanded character printing.
```

Expanded (Double Wide) Print (One Line Only)

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	SO
Hex Code:	N/A	OE
Purpose:	Selects expanded (double wide) print for one line only.	
Expression:	N/A	CHR$(14);
Comment:	This expanded print control code is a line−by−line print attribute; when the SO control code is received, one entire line of expanded characters will be printed double wide and automatically reset. This control code is reset by a paper motion control code (LF, VT, etc.), by the DC4 (double wide cancel) code, CR, ESC @ (printer reset), CAN, or ESC W (double wide print). ESC SO also selects expanded print for a single line.	
Example:	The following sample program illustrates expanded character printing for one line only.	

```
10 LPRINT "Control code"
20 LPRINT "SO selects"
30 LPRINT CHR$(14);
40 LPRINT "expanded character printing"
50 LPRINT "for one line only."
```

```
Control code
SO selects
expanded character printing
for one line only.
```

Extended Character Set

	P−SERIES	SERIAL MATRIX
ASCII Code:	SO (Shift Out)	ESC 4
Hex Code:	0E	1B 34
Purpose:	Selects the printable symbols in the range A0 to FF hex.	
Expression:	CHR$(14);	CHR$(27);“4”:
Comment:	Data bytes from 20 to 7F hex are printed as the printable symbols in the range A0 to FF hex. SOH SO performs the same function as the SO code. The P−Series SO control code is active for one line only. This control code is reset by a paper motion control code (LF, VT, etc.), CR, SOH@ (printer reset), or SI (shift in).	
Example:	The following sample program illustrates extended and primary character set selection. The sample printout is shown on two lines in order to fit the page.	

```
10 LPRINT "Control code"
20 LPRINT "ESC 4 selects the extended character set"
30 LPRINT "and ESC 5 selects the primary character set"
40 LPRINT "which is displayed beneath the extended character set."
50 LPRINT CHR$(27);"4";
60 FOR I = 32 TO 127
70 LPRINT CHR$(I);
80 NEXT I
90 LPRINT CHR$(27);"5"
100 FOR I = 32 TO 127
110 LPRINT CHR$(I);
120 NEXT I
```

```
Control code
ESC 4 selects the extended character set
and ESC 5 selects the primary character set
which is displayed beneath the extended character set.
áíóúñÑªº¿⌐¬½¼¡«»
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`
```

```
ßΓπΣσµτΦΘΩδ∞φ∈∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■
abcdefghijklmnopqrstuvwxyz{|}~
```

Extended Character Set Cancel (Primary Character Set Select)

	P−SERIES	SERIAL MATRIX
ASCII Code:	SI (Shift In)	ESC 5
Hex Code:	0F	1B 35
Purpose:	Data bytes from 20 to 7F hex will be printed with the printable symbols from 20 to 7F hex. This operation cancels the extended character set.	
Expression:	CHR$(15);	CRH$(27);“5”;
Comment:	SOH SI performs the same function as the SI code. An automatic SI action takes place at the end of each print line.	
Example:	Refer to the Extended Character Set control code for a sample program of extended and primary character set selection.	

Form Feed

	P−SERIES	SERIAL MATRIX
ASCII Code:	FF	FF
Hex Code:	0C	0C
Purpose:	Prints the data in the buffer and advances the paper to the next top−of−form and the printhead moves to the first character column. (See the comment.)	
Expression:	CHR$(12);	CHR$(12);
Comment:	The default forms length is determined by the value in non−volatile memory. Forms length is set by using the control panel F/L switch or forms length control codes. Code FF cancels all single−line only print attributes. In the P−Series mode with the EVFU loaded, the FF code will advance the paper to EVFU channel 1 (if defined) if the PI line is disabled, or to channel 13 (if defined) if the PI line is true and enabled. If undefined, a line feed will occur. If the DAVFU is selected and defined, the FF code will advance the paper to channel 1. In the Serial Matrix VFU mode, the FF code will advance the paper to top−of−form.	

Forms Length Set (Inches)

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	ESC C NUL n
Hex Code:	N/A	1B 43 0 n
Purpose:	Sets the length of forms (paper) in inches.	
Expression:	N/A	CHR$(27);″C″;CHR$(0);CHR$(n);
where:	n = 1 to 24 to specify the number of inches on a page.	
Comment:	Upon receipt of this code, the current line becomes the first line of the form. Changing the line spacing will not affect this forms length command. Skip−over perforation is set to the default value. Vertical tab positions set below the bottom of the form are ignored. Forms length can also be set by the F/L switch on the control panel. The control code forms length setting from the host computer will override the control panel setting and be reflected on the display when F/L is pressed. Forms length is stored in inches; therefore, subsequent line spacing changes do not affect the result of this command.	

Forms Length Set (Lines)

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	ESC C n
Hex Code:	N/A	1B 43 n
Purpose:	Sets the length of a form (paper) in lines.	
Expression:	N/A	CHR$(27);″C″;CHR$(n);
where:	n = 1 to 127 (all others are ignored) to specify the number of lines per page at the current line spacing.	
Comment:	The quotient of forms length in lines and lines per inch cannot exceed 226 inches, or incorrect forms length will result. The forms length may also be set by the F/L switch on the control panel. The control code forms length setting from the host computer will override the control panel setting and be reflected on the display when F/L is pressed. When this code is received, the current line becomes the first line of the form. Skip−over perforation is set to the default value. Forms length is stored in inches; therefore, subsequent line spacing changes do not affect the result of this command.	

Horizontal Tab

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	HT
Hex Code:	N/A	09
Purpose:	Moves the logical printhead rightward to the next horizontal tab stop.	
Expression:	N/A	CHR$(9);
Comment:	Power−on default horizontal tabs are set at .8−inch increments in the Serial Matrix Mode. If there are no horizontal tabs set or the logical printhead is located at the last character column, the code is ignored and no movement occurs. Horizontal tabs are stored as an absolute position; therefore character pitch changes will not change horizontal tab positions. Refer to the Horizontal Tab Set control code to set new tab positions.	
Example:	Refer to the Horizontal Tab Set control code for a sample program of horizontal tab setting and accessing.	

Horizontal Tab Set

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	ESC D n
Hex Code:	N/A	1B 44 n

Purpose: Sets up to 32 horizontal tab positions.

Expression: CHR$(27);″D″;CHR$(n1);...CHR$(n32);CHR$(0);

where: n1 through n32 specify the character column of the tab positions.

Comment: Up to 32 different tab positions may be set in ascending order. The physical tab position is the product of “n” and the current cell width (1/pitch), excluding double wide. The values must be in ascending order; if not in ascending order, the sequence up to and including the OUT OF ORDER symbol is ignored. The remainder of the sequence is handled as printable data. Tabs positioned beyond 13.2 inches are also ignored.

Tab positions may be cleared by sending the ESC D 0. Cycling printer power off and on will retain previously set values, not restore default values. Horizontal tabs are accessed by control code HT.

Example: The following example illustrates horizontal tab setting and accessing.

```
10 LPRINT "Control code"
20 LPRINT "ESC D CHR$(4);CHR$(10);CHR$(0)"
30 LPRINT "sets tab stops at columns 4 and 10."
40 LPRINT "Control code HT"
50 LPRINT "accesses the tab stops as follows:"
60 LPRINT CHR$(27);"D";CHR$(4);CHR$(10);CHR$(0);
70 LPRINT CHR$(9);
80 LPRINT "column 4"
90 LPRINT CHR$(9);CHR$(9);
100 LPRINT "column 10"
```

```
Control code
ESC D CHR$(4);CHR$(10);CHR$(0)
sets tab stops at columns 4 and 10.
Control code HT
accesses the tab stops as follows:
    column 4
          column 10
```

International Character Set Select

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH R n	ESC R n
Hex Code:	01 52 n	1B 52 n
Purpose:	Selects one of nine international character sets.	
Expression:	CHR$(1);″R″;CHR$(n);	CHR$(27);″R″;CHR$(n);

where: n = 0 to 9 to specify the character set as described below.

n	Character Set	Hex
0	U.S.A. ASCII	00 or 30
1	French	01 or 31
2	German	02 or 32
3	English	03 or 33
4	Danish	04 or 34
5	Swedish	05 or 35
6	Italian	06 or 36
7	Spanish	07 or 37
8	Japanese	08 or 38
9	French Canadian	09 or 39

Comment: The international character set can also be selected from the control panel. The control code setting will override the control panel character set selection. Values other than 0−9 will default to 0 (U.S.A. ASCII). See Appendix B for foreign character sets.

Example: The following example illustrates international character selection.

```
10 LPRINT "Control code ESC R 5 selects"
20 LPRINT "the Swedish character set shown beneath"
30 LPRINT "the USA (ASCII) characters."
40 LPRINT
50 LPRINT "A B C D [ \ ] ^ ` { | } ~"
60 LPRINT CHR$(27);"R";CHR$(5);
70 LPRINT "A B C D [ \ ] ^ ` { | } ~"
80 LPRINT CHR$(27);"R";CHR$(0);
```

```
Control code ESC R 5 selects
the Swedish character set shown beneath
the USA (ASCII) characters.

A B C D [ \ ] ^ ` { | } ~
A B C D Ä Ö Å Ü - é ä ö å ü
```

Line Feed

	P−SERIES	SERIAL MATRIX
ASCII Code:	LF	LF
Hex Code:	0A	0A
Purpose:	Prints the data in the buffer (if any) and advances the paper one line at the current line space setting. See the comment.	
Expression:	CHR$(10);	CHR$(10);
Comment:	If configured for LF equals newline (LF=CR+LF), the logical print head is positioned at character column 1 of the new line. Otherwise, the logical print head does not move when configured for LF function only (LF=LF ONLY). The LF function cancels all single line print attributes such as double high (elongated) and double wide (expanded) characters. This code is always configured for LF=CR+LF in the P−Series mode. In the P−Series Even Dot Plot mode (high density graphics), the LF code does not cause paper motion; the data in the buffer is plotted and the logical print head is positioned at character column 1 in anticipation of the Odd Dot Plot control code to complete high density graphic plotting. In the P−Series Odd Dot Plot mode (normal density graphics), the LF code plots the data in the buffer, advances the paper a single dot row at the current vertical dot density, and positions the logical print head at character column 1.	

Line Feed n/216 Inch (one line only)

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	ESC J n
Hex Code:	N/A	1B 4A n
Purpose:	Advances paper n/216 inch for one line only.	
Expression:	N/A	CHR$(27);″J″;CHR$(n);
where:	n = 1 to 555	
Comment:	The n/216−inch line feed control code is effective for one line only. All single−line−only print attributes are canceled. The paper moves only in multiples of the current dot row spacing. If the distance to move is other than a multiple of the current dot row spacing, the remainder is added to the next paper motion command.	
Example:	The following example illustrates n/216−inch line spacing.	

```
10 LPRINT "Control code ESC J 200";
20 LPRINT CHR$(27);"J";CHR$(200);
30 LPRINT "performs a 200/216 inch"
40 LPRINT "line feed function for one line only."
```

```
Control code ESC J 200
```

```
performs a 200/216 inch
line feed function for one line only.
```

Line Spacing 1/6 Inch

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH 2	N/A
Hex Code:	01 32	N/A
Purpose:	Sets line spacing at 1/6−inch (6 lpi). See comment.	
Expression:	CHR$(1);"2";	N/A
Comment:	When the 1/6−inch line spacing control code is received, all lines will be printed at 6 lpi until a new line spacing is selected or power is reset. The control code line spacing selection will override the control panel line spacing setting, and 6 lpi will be reflected on the display when the 6/8 lpi switch is pressed.	
Example:	Refer to the Line Spacing n/72 Inch (Asserted) control code for a sample program of 1/6−inch line spacing.	

Line Spacing 1/8 Inch (8 lpi)

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH 0	ESC 0
Hex Code:	01 30	1B 30
Purpose:	Sets continuous line spacing at 1/8−inch (8 lpi). See comment.	
Expression:	CHR$(1);″0″;	CHR$(27);″0″;
Comment:	When the 1/8−inch line spacing control code is received, all lines will be printed at 8 lpi until a new line spacing is selected or power is reset. The control code line spacing selection will override the control panel line spacing setting and 8 lpi will be reflected on the display when the 6/8 LPI switch is pressed.	
Example:	The following example illustrates 1/8−inch line spacing.	

```
10 LPRINT "Control code ESC 0 sets"
20 LPRINT CHR$(27);"0";
30 LPRINT "line spacing at"
40 LPRINT "1/8 (8 lpi) inch for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
Control code ESC 0 sets
line spacing at
1/8 (8 lpi) inch for all subsequent lines
until reset or another spacing is selected.
```

Line Spacing 8 lpi (One Line Only)

	P−SERIES	SERIAL MATRIX
ASCII Code:	ACK	N/A
Hex Code:	06	N/A
Purpose:	Selects line spacing of 1/8 inch for one line only.	
Expression:	CHR$(6);	N/A
Comment:	The default line spacing is reselected automatically after one line. Line spacing may be selected either by the control panel 6/8 LPI switch or by line spacing control codes. The control code setting will override the setting on the display. 8 lpi spacing for one line applies only to P−Series programming compatibility. In Serial Matrix mode, 8 lpi line spacing for a single line can be accomplished by using ESC J (Line Spacing n/216−Inch), where n=27 (27/216) and Line Feed = new line. Serial Matrix compatible control code ESC 0 and P−Series SOH 0 can be used for continuous 1/8−inch line spacing.	
Example:	The following example illustrates 1/8 inch line spacing set for one line only.	

```
10 LPRINT "Control code ACK"
20 LPRINT "selects 8 lpi line spacing"
30 LPRINT CHR$(6);"for one line only."
40 LPRINT "The default line spacing is"
50 LPRINT "then reselected automatically."
```

```
Control code ACK
selects 8 lpi line spacing
for one line only.
The default line spacing is
then reselected automatically.
```

Line Spacing 7/72 Inch

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	ESC 1
Hex Code:	N/A	1B 31
Purpose:	Specifies the line spacing at 7/72−inch increments.	
Expression:	N/A	CHR$(27);″1″;
Comment:	When the 7/72−inch line spacing control code is received, all lines will be printed at the 7/72−inch line spacing until a new line spacing is selected or power is reset. The control code line spacing selection will override the control panel line spacing setting, and the message display will reflect the line spacing as 10.3 lines per inch.	
Example:	The following example illustrates 7/72−inch line spacing.	

```
10 LPRINT "Control code ESC 1 sets"
20 LPRINT CHR$(27);"1";
30 LPRINT "line spacing at"
40 LPRINT "7/72 inch for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
Control code ESC 1 sets
line spacing at
7/72 inch for all subsequent lines
until reset or another spacing is selected.
```

Line Spacing n/72 Inch (Asserted)

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	ESC 2
Hex Code:	N/A	1B 32
Purpose:	Asserts line spacing value which has been set by ESC A (Line Spacing n/72 inch, stored). See comment.	
Expression:	N/A	CHR$(27);″2″ ;
Comment:	When the ESC 2 control sequence is received, all line feeds following the command will be set at n/72−inch as set by the value stored in ESC A. If no line spacing has been defined by ESC A, the line spacing is set to 6 lpi. The control code line spacing selection will override the control panel line spacing setting.	
Example:	The following example illustrates 1/6−inch line spacing and assumes that a distance has not been set for ESC A.	

```
10 LPRINT "Control code ESC 2 sets"
20 LPRINT CHR$(27);"2";
30 LPRINT "line spacing at"
40 LPRINT "6 lpi for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
Control code ESC 2 sets
line spacing at
6 lpi for all subsequent lines
until reset or another spacing is selected.
```

Line Spacing n/72 Inch (Stored)

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	ESC A n
Hex Code:	N/A	1B 41 n
Purpose:	Stores the line spacing at n/72−inch increments.	
Expression:	N/A	CHR$(27);″A″;CHR$(n);
where:	n = 1 to 85 (all others are ignored)	
Comment:	When the ESC A control sequence is received, all line feed commands following an ESC 2 sequence* will be at n/72−inch line spacing until a new line spacing is selected or power is reset. The control code line spacing selection will override the control panel line spacing setting and the message display will reflect the line spacing in lines per inch. For the 20/72−inch example below, the message display would reflect 3.6 lpi spacing. *The ESC 2 sequence indicates that the current line spacing is that which was set by the previous ESC A sequence.	
Example:	The following example illustrates 20/72−inch line spacing.	

```
10 LPRINT "Control code ESC A 20 sets"
20 LPRINT CHR$(27);"A";CHR$(20);CHR$(27);"2";
30 LPRINT "line spacing at 20/72 inch"
40 LPRINT "increments for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
Control code ESC A 20 sets
line spacing at 20/72 inch

increments for all subsequent lines

until reset or another spacing is selected.
```

Line Spacing n/216 Inch

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	ESC 3 n
Hex Code:	N/A	1B 33 n
Purpose:	Specifies the line spacing at n/216−inch increments.	
Expression:	N/A	CHR$(27);″3″;CHR$(n);
where:	n = 1 to 255	
Comment:	When the n/216−inch line spacing control code is received, all line feeds following will be at n/216−inch line spacing until a new line spacing is selected or power is reset. The control code line spacing selection will override the control panel line spacing setting and the message display will reflect the line spacing in lines per inch. For a 50/216−inch line spacing, the message display would reflect 4.3 lpi spacing. The paper moves only in multiples of the current dot row spacing. If the distance to move is other than a multiple of the current dot row spacing, the remainder is added to the next paper motion command.	
Example:	The following example illustrates n/216−inch line spacing.	

```
10 LPRINT "Control code ESC 3 50 sets"
20 LPRINT CHR$(27);"3";CHR$(50);
30 LPRINT "line spacing at 50/216 inch"
40 LPRINT "increments for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
Control code ESC 3 50 sets
line spacing at 50/216 inch
increments for all subsequent lines
until reset or another spacing is selected.
```

Overscoring

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH _ n	ESC _ n
Hex Code:	01 5F n	1B 5F n
Purpose:	Enables or disables automatic overscoring of all characters.	
Expression:	CHR$(1);"_";CHR$(n);	CHR$(27);"_";CHR$(n);
where:	n = 0 to disable automatic overscoring (hex 00 or hex 30) n = 1 to enable automatic overscoring (hex 01 or hex 31)	
Comment:	When automatic overscore is enabled, all characters will be overscored until disabled. Automatic overscoring will reduce print speed to half the normal value.	
Example:	The following sample program illustrates automatic overscoring and overscoring reset.	

```
10 LPRINT "Control code ESC _ 1"
20 LPRINT CHR$(27);"_";CHR$(1);
30 LPRINT "enables automatic overscoring."
40 LPRINT "Control code ESC _ 0"
50 LPRINT CHR$(27);"_";CHR$(0);
60 LPRINT "disables automatic overscoring."
```

```
Control code ESC _ 1
enables automatic overscoring.
Control code ESC _ 0
disables automatic overscoring.
```

Plot, Even Dot (P−Series High Density Graphics)

	P−SERIES	SERIAL MATRIX
ASCII Code:	EOT	EOT
Hex Code:	04	04
Purpose:	Prints dots at the even numbered dot columns.	
Expression:	CHR$(4);	CHR$(4);
Comment:	The even dot plot code is used for programming high density graphics and must be used in conjunction with the Odd Dot Plot code (05 Hex). This code should occur before any printable data in the data stream for maximum throughput. In even dot plot, line feed codes do not cause paper motion. Refer to the Graphics chapter for more information.	
Example:	The following sample program illustrates two high density plot boxes using odd and even dot plot for high density graphics. Compare the example below to the plot, odd plot control code example.	

```
10 LPRINT "EVEN AND ODD DOT PLOT" : LPRINT
20 LPRINT CHR$(4);"??????@@@@@@??????"
30 LPRINT CHR$(5);"??????@@@@@@??????"
40 FOR I=1 TO 36
50 LPRINT CHR$(4);"A@@@@ @@@@@@A@@@@ "
60 LPRINT CHR$(5);"A@@@@ @@@@@@A@@@@ "
70 NEXT I
80 LPRINT CHR$(4);"??????@@@@@@??????"
90 LPRINT CHR$(5);"??????@@@@@@??????"
```

```
EVEN AND ODD DOT PLOT
```

Plot, Odd Dot (P−Series Normal Density Graphics)

	P−SERIES	SERIAL MATRIX
ASCII Code:	ENQ	ENQ
Hex Code:	05	05
Purpose:	Prints dots at the odd numbered dot columns.	
Expression:	CHR$(5);	CHR$(5);
Comment:	This is the P−Series programming normal density graphics control code. This code should occur before any printable data in the data stream for maximum throughput. A line feed (LF) defines the end of plot data may causes paper to be advanced at the current print mode vertical resolution:1/72 inch for DP, 1/96 inch for Correspondence, and 1/48 inch for High Speed. For high density graphics, the Even Dot Plot code (04 Hex) must be used in conjunction with (and precede) the Odd Dot Plot code. More information is given in the Graphics chapter. When Plot mode is exited, the previously selected print mode and attributes are reselected.	
Example:	The following program illustrates two normal density plot boxes using odd dot plot. Compare the plot, even dot control code example.	

```
10 LPRINT "ODD DOT PLOT" : LPRINT
20 LPRINT CHR$(5);"??????@@@@@@??????"
30 FOR I=1 TO 36
40 LPRINT CHR$(5);"A@@@@ @@@@@@A@@@@ "
50 NEXT I
60 LPRINT CHR$(5);"??????@@@@@@??????"
```

```
ODD DOT PLOT
```

Printer Deselect

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	DC3
Hex Code:	N/A	13
Purpose:	Places printer in the deselected mode.	
Expression:	N/A	CHR$(19);
Comment:	When the configuration parameter PRINTER SELECT is enabled, this control code will deselect the printer from the print mode state. Until a DC1 (Printer Select) command is received, all subsequent data to the printer is ignored.	

Printer Reset

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH @	ESC @
Hex Code:	01 40	1B 40
Purpose:	Initializes all print mode related parameters to default values.	
Expression:	CHR$(1);″@″ ;	CHR$(27);″@″ ;
Comment:	When reset to the load default values, the current line is set to the top−of−form position. Horizontal tabs, print mode, line spacing, and character pitch are reset to default values. Character−by−character and line−by−line attributes are canceled, and the Vertical Format Unit is cleared. Interface parameters and emulation mode (P−Series or Serial Matrix) are not affected.	

Printer Select

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	DC1
Hex Code:	N/A	11
Purpose:	Places printer in print mode.	
Expression:	N/A	CHR$(17);
Comment:	When the configuration parameter PRINTER SELECT is enabled, this control code will place the printer in the print mode state.	

Print Mode/Pitch Selection

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH X mn	ESC X mn
Hex Code:	01 58 mn	1B 58 mn

Purpose: Selects the print mode (Data Processing, Correspondence, or High Speed) and character pitch in characters per inch (cpi).

P−Series

Expression: CHR$(1);″X″;CHR$(m);CHR$(n);

Serial Matrix

CHR$(27);″X″;CHR$(m);CHR$(n);

where: m = Print Mode code n = Pitch (cpi)
Values other than shown in Table 6−1 below are ignored.

Comment: Refer to Table 6−1 to identify character pitches available by print mode. A complete table identifying print rates, pitch, and dot densities for all print modes is located in the Appendix.

A maximum of four different character pitches may be used on any line and may be selected as often as desired.

Print mode and pitch can also be selected from the control panel. The print mode/pitch select control code from the host computer will override the control panel print mode setting and the print mode and pitch selection will be reflected on the message display when the PRINT MODE switch is pressed.

NOTE: The print mode (m) must be changed before the first printable symbol of a print line (spaces excluded) or the command sequence is deferred until the next line.

Table 6−1. Character Pitches Available by Print Mode

m (hex):	0(30)	1(31)	2(32)
PRINT MODE:	Data Processing (DP)	Correspondence (NLQ)	High Speed (HS)
n (hex):	**Characters per inch:**		
0(30)	10	10	10
1(31)	12	12	12
2(32)	13.3	13.3	13.3
3(33)	15	15	
4(34)	17.1	17.1	

RibbonMinder, Enable/Disable

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH r E SOH r D	ESC r E ESC r D
Hex Code:	01 72 45 01 72 44	1B 72 45 1B 72 44
Purpose:	Enables or disables the RibbonMinder printer action.	
Expression:	CHR$(1);“rE”; CHR$(1);“rD”;	CHR$(27);“rE”; CHR$(27);“rD”;
where:	E = enable D = disable	
Comment:	Refer to the RibbonMinder chapter for more information.	
Example:	The following sample program illustrates the control code for a RibbonMinder set up for a typical job: Job Rate = 270, When Worn Action = Stop Printer, Enable.	

```
10 LPRINT "Control Code ESC r J sets the job rate."
20 LPRINT CHR$(27);"rJ270E";
30 LPRINT "Control Code ESC r A S set the when worn action."
40 LPRINT CHR$(27);"rAS";
50 LPRINT "Control Code ESC r E enables the RibbonMinder."
60 LPRINT CHR$(27);"rE";
70 LPRINT "The remainder of the job follows."
```

```
Control Code ESC r J sets the job rate.
Control Code ESC r A S set the when worn action.
Control Code ESC r E enables the RibbonMinder.
The remainder of the job follows.
```

RibbonMinder, Set Job Rate

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH r J NNNN E	ESC r J NNNN E
Hex Code:	01 72 4A NNNN 45	1B 72 4A NNNN 45

Purpose: Sets printer job rate.

P−SERIES

Expression: CHR$(1);“rJNNNNE”;

SERIAL MATRIX

CHR$(27);“rJNNNNE”;

where: NNNN is the JOB RATE expressed as a decimal number having between one and four digits. NNNN must be a value between 0 and 1000, and is represented by an ASCII sequence. For example, if the JOB RATE value is 341, the control code sequence will be CHR$(27);“rJ341E”;

Comment: Refer to the RibbonMinder chapter to determine the job rate and job analysis, and for more information on the RibbonMinder feature.

Example: Refer to the RibbonMinder, Enable/Disable control code for a sample program of a RibbonMinder set up for a typical job.

RibbonMinder, When Worn Action

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH r A S SOH r A A SOH r A V	ESC r A S ESC r A A ESC r A V
Hex Code:	01 72 41 53 01 72 41 41 01 72 41 56	1B 72 41 53 1B 72 41 41 1B 72 41 56
Purpose:	Determines printer action when ribbon is worn.	
Expression:	CHR$(1);“rAS”; CHR$(1);“rAA”; CHR$(1);“rAV”;	CHR$(27);“rAS”; CHR$(27);“rAA”; CHR$927);“rAV”;

where:
S = stops the printer upon completion of the page when worn ribbon detected
A = activates audio and visual alarm when worn ribbon detected
V = activates only visual alarm when worn ribbon detected

Comment: Refer to the RibbonMinder chapter for more information.

Example: Refer to the RibbonMinder, Enable/Disable control code for a sample program of a RibbonMinder set up for a typical job.

Skip−Over Perforation

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	ESC N n
Hex Code:	N/A	1B 4E n
Purpose:	Selects the number of lines (at the current line spacing) for the paper "skip" at the bottom of the perforated page.	
Expression:	N/A	CHR$(27);″N″;CHR$(n);
where:	n = 1 to 127 to select the number of lines to skip. If the value of n exceeds the current forms length, the sequence is ignored.	
Comment:	The actual distance set is the product of "n" and the current line spacing. Factory default value is 1 inch. The current default value may be set by the operator. Setting a new forms length (ESC C) resets skip−over perforation to the default value. The quotient of forms length (in lines) and lines per inch cannot exceed 113 inches, or incorrect forms length will result. Vertical tabs in the skip−over perforation zone are ignored. Skip−over perforation is disabled when the vertical format unit (VFU) is loaded. Skip−over perforation can also be selected from the control panel. The control code skip−over perforation setting from the host computer will override the control panel setting; the control panel display will indicate the setting has been selected by the host.	

Skip−Over Perforation Cancel

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	ESC O (alpha O)
Hex Code:	N/A	1B 4F
Purpose:	Resets skip−over perforation to the previously set default value.	
Expression:	N/A	CHR$(27);″O″ ;

Superscript/Subscript Printing

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH S n	ESC S n
Hex Code:	01 53 n	1B 53 n
Purpose:	Selects superscript or subscript printing.	
Expression:	CHR$(1);″S″;CHR$(n);	CHR$(27);″S″;CHR$(n);
where:	n = 0 to enable superscript printing (hex 00 or hex 30) n = 1 to enable subscript printing (hex 01 or hex 31)	
Comment:	Super/Subscript font prints at one−half the normal vertical character height and at twice the normal vertical density. When the super/subscript control code is received, all characters will be superscript or subscript until reset by the super/subscript reset control code or printer reset. Both superscript and subscript characters can be printed in the same character column in the Serial Matrix mode by using the Backspace control code feature. Emphasized print is ignored in the super/subscript print mode.	
Example:	The following sample program illustrates superscript/subscript printing and reset.	

```
10 LPRINT "Control Code ESC S 0 selects";
20 LPRINT CHR$(27);"S";CHR$(0);" SUPERSCRIPT";CHR$(27);"T"
30 LPRINT "A";CHR$(27);"S";CHR$(0);"2";CHR$(27);"T";
40 LPRINT "+B";CHR$(27);"S";CHR$(0);"2";CHR$(27);"T";
50 LPRINT "=C";CHR$(27);"S";CHR$(0);"2";
60 LPRINT CHR$(27);"T"
70 LPRINT "Control Code ESC S 1 selects";
80 LPRINT  CHR$(27);"S";CHR$(1);" SUBSCRIPT";CHR$(27);"T"
90 LPRINT "31";CHR$(27);"S";CHR$(1);"HEX";CHR$(27);"T";
100 LPRINT "=48";CHR$(27);"S";CHR$(1);"DEC";
110 LPRINT CHR$(27);"T"
120 LPRINT "Control Code ESC T cancels"
130 LPRINT "superscript/subscript printing."
```

```
Control Code ESC S 0 selects SUPERSCRIPT
A2+B2=C2
Control Code ESC S 1 selects SUBSCRIPT
31HEX=48DEC
Control Code ESC T cancels
superscript/subscript printing.
```

Superscript/Subscript Printing Reset

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH T	ESC T
Hex Code:	01 54	1B 54
Purpose:	Resets superscript and subscript printing.	
Expression:	CHR$(1);″T″;	CHR$(27);″T″;
Comment/Example:	Refer to the Superscript/Subscript control code for a sample program of superscript/subscript printing and reset.	

Underline

	P−SERIES	SERIAL MATRIX
ASCII Code:	SOH −n	ESC −n
Hex Code:	01 2D n	1B 2D n
Purpose:	Enables or disables automatic underlining of all characters.	
Expression:	CHR$(1);″−″;CHR$(n);	CHR$(27);″−″;CHR$(n);
where:	n = 0 to disable automatic underlining (hex 00 or hex 30) n = 1 to enable automatic underlining (hex 01 or hex 31)	
Comment:	When automatic underline is enabled, all characters will be underlined until disabled. Automatic underlining will reduce print speed to half the normal value.	
Example:	The following sample program illustrates automatic underlining and underlining reset.	

```
10 LPRINT "Control code ESC -1"
20 LPRINT CHR$(27);"-";CHR$(1);
30 LPRINT "enables automatic underlining."
40 LPRINT "Control code ESC -0"
50 LPRINT CHR$(27);"-";CHR$(0);
60 LPRINT "disables automatic underlining."
```

```
Control code ESC -1
enables automatic underlining.
Control code ESC -0
disables automatic underlining.
```

Vertical Tab

	P−SERIES	SERIAL MATRIX
ASCII Code:	VT	VT
Hex Code:	0B	0B
Purpose:	Prints the data in the buffer and advances the paper to the next vertical tab position.	
Expression:	CHR$(11);	CHR$(11);
Comment:	In the P−Series emulation mode, if a vertical tab format is defined in either the EVFU (channel 12) or DAVFU (channel 2) and the VFU is enabled, the paper is moved to the next such position. In the Serial Matrix emulation mode, if Vertical Tabs are loaded and enabled, the paper moves to the next tab position. If a vertical tab format is not defined, the paper is advanced to the next line at the current line spacing. If a vertical tab format is defined but no vertical tab positions are set between the current print position and the end of the form, in P−Series the paper is advanced to the first defined tab position on the next form; in Serial Matrix the paper is advanced to the top of the next form. The VT code resets all single line print attributes. More information on Vertical Tabs is provided in the Vertical Format Units chapter.	
Example:	Refer to the Vertical Tab Set control code for a sample program of vertical tab setting and accessing.	

Vertical Tab Set (Serial Matrix)

	P−SERIES	SERIAL MATRIX
ASCII Code:	N/A	ESC B n
Hex Code:	N/A	1B 42 n

Purpose: Sets vertical tab positions.

Expression: CHR$(27);″B″;CHRS(n);...CHR$(nk);CHR$(0);

where: n1 through nk specify the line number for the vertical tab(s), for a maximum of 16 tab positions. CHR$(0) is the sequence terminator.

Comment: The physical position on the paper is the product of “n” and the current line spacing. Subsequent line spacing changes do not change the tab position. If the value of “n” defines a tab stop that exceeds the forms length, that tab position is ignored.

In the Serial Matrix mode, vertical tab positions are set by control code ESC B and executed by control code VT. The tab positions must be in ascending order or the sequence will terminate. More information regarding Serial Matrix vertical tab setting is provided in the Vertical Format Units chapter.

Example: The following sample program illustrates Vertical Tab setting and accessing.

```
10 LPRINT "Control code"
20 LPRINT "ESC B 5 10 0 sets a vertical tab at line 5 and at line 10."
30 LPRINT CHR$(27);"B";CHR$(5);CHR$(10);CHR$(0);
40 LPRINT "This is line three."
50 LPRINT CHR$(11);"Control code VT moves paper to the next vertical tab "
60 LPRINT CHR$(11);"This is line ten."
```

```
Control code
ESC B 5 10 0 sets a vertical tab at line 5 and at line 10.
This is line three.

Control code VT moves paper to the next vertical tab



This is line ten.
```

CHAPTER 7

INTERFACES

Introduction

P6000L/P6200L Series printers are equipped with resident parallel and serial interfaces. Each printer is configured at the factory for either Dataproducts parallel, Centronics parallel, or RS−232 serial interface. If required, an interface conversion kit is available from *Printronix*. Contact your authorized representative for details.

NOTE: If a change is made from a Dataproducts parallel to a Centronics parallel interface or vice versa, the I/O cable and connector assembly must be changed as described in the Interface Conversion Kit instructions. Parallel interface configuration parameters can be modified as required by the application. If a change is made from either parallel interface to the RS−232 serial interface or vice versa, the jumper platform at location 6A on the C3 logic board must be reversed (removed, turned around, and reinstalled) in addition to changing the I/O cable and connector assembly and the interface configuration parameters. Refer to the Interface Conversion Kit instructions and the Interface Jumper Platform section in this chapter for details.

This chapter describes:

- Dataproducts Parallel Interface
- Centronics Parallel Interface
- RS−232 Serial Interface
- Alternate Terminating Resistors
  - Floor Cabinet Model
  - Pedestal Model
- Interface Jumper Platform

Dataproducts Parallel Interface

This interface allows the printer to operate with controllers designed for Dataproducts printers using a 50 pin AMP Ampilite HDH−20 type connector. The interface is capable of transferring up to 300,000 characters per second. The maximum data line cable length from the controller or host computer to the printer is 40 feet.An optional Dataproducts long lines adapter is available, permitting cable length up to 2000 feet.

Dataproducts Interface Signals

Dataproducts compatible interface signals between the computer and the printer are defined as follows. Table 7−1 lists the Dataproducts interface connector pin assignments.

Ready Line − A high true level from the printer indicating ac power and dc voltages are present, paper is loaded properly, and the printer is not in a check condition.

On Line − A high true level from the printer indicating the Ready Line is true and the ON LINE switch on the control panel has been activated.

Data Request − A high true level from the printer to synchronize host data transmission with printer timing.

Data Strobe − A high true pulse from the host to indicate that data is ready. The data strobe remains high until the Data Request line goes false.

Data Lines − Eight high or low levels from the host that specify character data, plot data, or a control code. Sensing Data Line 8 is controlled by printer configuration.

+5 Volt Test − +5 Vdc output for operating the *Printronix* test exerciser.

Paper Instruction (PI) − Optional high true level EVFU signal from the host with the same timing as the data lines. Sensing the PI line is controlled by printer configuration.

Interface Verification − Two pins on the interface connector jumpered together to allow the user to verify proper installation of the interface connector.

Table 7−1.
Connector Pin Assignments for Dataproducts Interface with AMP Connector

INPUT SIGNALS		OUTPUT SIGNALS	
SIGNAL	**PIN**	**SIGNAL**	**PIN**
Data Line 1	19	Ready	22
Return	3	Return	6
Data Line 2	20	On Line	21
Return	4	Return	5
Data Line 3	1	Data Request	23
Return	2	Return	7
Data Line 4	41	+5 Volts	12
Return	40	(Test Only)	
Data Line 5	34	I/F Verif.	46,45
Return	18		
Data Line 6	43	Ground	11, 27,
Return	25		39
Data Line 7	36	Not Used	31
Return	35		
Data Line 8	28		
Return	44		
Paper Instr.	30		
Return	14		
Data Strobe	38	Pins not listed	
Return	37	are not connected	
IBOF	24,50		
Return	8,32		
(Bottom of Form)			

Parallel Interface Configuration

The printer is configured at the factory for the type of interface used, either parallel or serial. However, certain user selectable configuration options are available. The following configuration parameters can be verified or changed as necessary to meet specific application requirements:

- Input buffer size
- Sense of Data Line 8
- Sense of the Paper Instruction line
- Data Polarity
- Printer Error Polarity

These parameters are displayed under the Application Compatibility and Interface Compatibility menus selectable from the control panel. This data may be latched on either the leading or the trailing edge of the Data Strobe signal by selecting the appropriate jumper on the Logic C3 board. Refer to Control Panel Switch Function diagram in the Configuration chapter for detailed information on selecting the various parameter values.

NOTE: If there are extra or missing characters, try changing the strobe edge select from leading to trailing.

Centronics Parallel Interface

This interface enables the printer to operate with controllers designed for buffered Centronics printers. The interface is capable of transferring up to 200,000 characters per second. The maximum data line cable length from the controller or host computer to the printer is 40 feet.

Centronics Interface Signals

Centronics interface signals between the computer and the printer are defined as follows. Table 7−2 lists the Centronics interface connector pin assignments.

PE − A high true level from the printer to indicate the printer is in a check condition.

SLCT − A high true level from the printer to indicate the printer is ready for data transfer and the ON LINE switch has been activated.

Busy − A high true level from the printer to indicate the printer cannot receive data.

ACKNLG − A low true pulse from the printer indicating the character or function code has been received and the printer is ready for the next data transfer.

Data Strobe − A low true, 100 ns minimum pulse from the host to clock data into the printer.

Data Lines − Eight high true levels from the host that specify a character or function code. Sensing Data Line 8 is controlled by printer configuration.

+5 Volt Test − +5 Vdc output for operating a *Printronix* test exerciser drawing up to one ampere of current.

Paper Instruction (PI) − Optional EVFU control signal from the host with the same timing as the data lines. Sensing the PI line is controlled by printer configuration.

NOTE: The PI Line must be disabled (configuration option selected from the front panel) if the host computer does not drive or control the PI Line. If the line is not controlled by the host and sensing is enabled, rapid paper slewing will occur.

Table 7−2. Centronics Interface Connector Pin Assignments

INPUT SIGNALS		OUTPUT SIGNALS	
SIGNAL	**PIN**	**SIGNAL**	**PIN**
Data Line 1	2	ACKNLG	10
Return	20	Return	28
Data Line 2	3	SLCT/IONL	32,13
Return	21		
Data Line 3	4	PE	12
Return	22		
Data Line 4	5	+5 Volts	
Return	23	(Test Only)	18
Data Line 5	6		
Return	24		
Data Line 6	7	Busy	11
Return	25	Return	29
Data Line 7	8	Chassis	16,17
Return	26	Ground	33
Data Line 8	9		
Return	27		
Paper Instr.	15	Not Used	30,31,
Return	14		34,35, 36
Data Strobe	1		
Return	19		

Parallel Interface Configuration

The printer is configured at the factory for the type of interface used, either parallel or serial. However, certain user selectable configuration options are available. The following configuration parameters can be verified or changed as necessary to meet specific application requirements:

- Input buffer size
- Sense of Data Line 8
- Sense of the Paper Instruction line
- Data Polarity
- Printer Error Polarity
- Fast Busy

These parameters are displayed under the Application Compatibility and Interface Compatibility menus selectable from the control panel. This data may be latched on either the leading or the trailing edge of the Data Strobe signal by selecting the appropriate jumper on the Logic

C3 board. Refer to Control Panel Switch Function diagram in the Configuration chapter for detailed information on selecting the various parameter values.

NOTE: If there are extea or missing characters, try changing the strobe edge select from leading to trailing.

RS−232 Serial Interface

This interface enables the printer to operate with bit serial devices compatible to an RS−232C controller. The input serial data transfer baud rate is selectable from the control panel. Baud rates of 150, 300, 600, 1200, 2400, 4800, 9600, 19,200 or external control are available. Baud rates are selected from the control panel; external control is selected by jumper configuration on the logic C board as described in the Configuration chapter. The input format consists of a single start bit, 7 or 8 data bits, and one or two stop bits. The number of data bits is determined by printer configuration. The data bits are interpreted with the least significant bit first. Parity checking is determined by printer configuration setup options selected from the control panel. The printer interface uses a first in/first out buffer with the size configuration selectable from the control panel. The asynchronous interface accepts data as it is provided by the user. The maximum data line length (cable length) from the controller (host computer) to the printer is 50 feet. The interface circuit characteristics are compatible with the Electronic Industry Association Specification.

RS−232 Interface Signals

RS−232 compatible serial interface signals between the computer and the printer are defined as follows. The RS−232 connector mounted on the printer is a 25 pin DB−25S type. The mating connector is a DB−25P. Signal Pin assignments are listed in Table 7−3.

Received Data − Serial data stream to the printer.

Transmitted Data − Serial data stream from the printer for transmitting status and control information to the host. Subject to protocol selection.

Request To Send (RTS) − Control signal from the printer. Subject to configuration.

Clear to Send (CTS) − Status signal to the printer indicating the host is ready to receive data/status signals from the printer. If enabled from the configuration menu, the ON condition is required in both CTS and DSR for the printer to send to the host, including sending XON and XOFF handshake characters.

Data Set Ready (DSR) − Status signal to the printer indicating the host ready for the printer to send characters to the host.

Carrier Detect (CD) − Status signal to the printer. If enabled from the configuration menu, the ON condition is required in both CD and DSR for the printer to receive data. Available as a configuration setup option.

Reverse Channel − Control signal from the printer. Subject to configuration.

Data Terminal Ready (DTR) − Control signal from the printer. Subject to configuration.

Transmit Clock (TC) − An optional timing signal for transmitted data that may be provided by a Data Set with synchronous interface.

Receive Clock (RC) − An optional timing signal for Received Data that may be provided by a Data Set with synchronous interface.

External Clock (EC) − An asynchronous timing clock stream pulsed at 16 times the data bit input rate from an external TTL source when external baud rate has been selected.

Table 7−3. Serial Interface Pin Assignments

INPUT SIGNALS		OUTPUT SIGNALS	
SIGNAL	**PIN**	**SIGNAL**	**PIN**
Received Data	3	Transmitted Data	2
Clear To Send	5	Request To Send	4
Data Set Ready	6	Reverse Channel Send	11,14
Carrier Detect	8	Data Terminal Ready	20
Transmit Clock	15	Chassis Ground	1
Receive Clock	17	Signal Ground	7
External Clock	25		

Serial Interface Protocols

The following serial interface protocol characters are available. The protocol is configuration selectable from the control panel to meet host interface requirements.

XON/XOFF − The printer transmits an XON (11 Hex) character when entering the online state or when the buffer is almost empty. The printer transmits an XOFF (13 Hex) character when entering the offline state or when the buffer is almost full.

ETX/ACK − With ETX/ACK protocol selected, the printer interface operates in a block structured mode. The host sends a block of data (commonly 128 characters) in response to an ACK (06 Hex) character sent from the printer. The host marks the end of the block of data with an ETX (03 Hex) character. When the printer recognizes the ETX character, the printer releases the data block to be printed and checks the space available in the buffer. If space is available for the next block of data, the printer sends ACK to the host. If space is not available, the printer withholds ACK until sufficient space is available.

ACK/NAK − With ACK/NAK protocol selected, the printer responds as described for ETX/ACK protocol except the printer monitors the received data for parity error. If a parity error is

detected, a NAK (15 Hex) character is transmitted to the host upon receipt of the ETX character. The host is expected to repeat the data transmission.

NOTE: In ETX/ACK and ACK/NAK, avoid sending ETX (03 Hex) in Bit Image serial matrix graphics data.

PARITY ERROR – With an odd or even parity check in effect, the detected character error shall be replaced with a question mark (?). If a parity error is detected, a NAK character is transmitted to the host when the ACK/NAK protocol is selected. When parity is not checked, parity errors are ignored and the characters are printed as received. Parity checking is a configuration option selected from the control panel.

Serial Interface Configuration

The printer is configured at the factory for the type of interface used, either parallel or serial. However, certain user selectable configuration options are available. The following configuration parameters can be verified or changed as necessary to meet specific application requirements:

- Input buffer size (selected from the Application Compatibility menu)
- Data protocol (XON/XOFF, ACK/NAK, etc.)
- Data rate (BAUD rate selected from the control panel; external clock jumper selected)
- Data word length and MSB function
- Request to send behavior
- Data terminal ready behavior
- Reverse channel behavior
- Protocol character assignment

These parameters are displayed under the Application Compatibility and Interface Compatibility menus selectable from the control panel, except for external clock selection as noted above. Refer to the Control Panel Switch Function diagram in the Configuration chapter for detailed information on selecting the various parameter values.

Alternate Terminating Resistors

For parallel interface configurations, the printer is equipped with 1K ohm pullup terminating resistors located at U1 and U3 of the I/O cable assembly PCBA. Generally, the 1K ohm terminating resistors are suitable for most applications. If, however, the standard terminating resistor pack is not compatible with the particular interface driver requirements of the host, 220 ohm pullup and 330 ohm pulldown alternate terminating resistors are provided. *Printronix* recommends using the 330 ohm pulldown resistors in conjunction with the 220 ohm pullup resistors.

Floor Cabinet Model

To install the alternate terminating resistors in the floor cabinet model, perform the following instructions.

1. Turn off the printer and disconnect the ac power cord.
2. Remove the six screws securing the I/O panel at the lower rear corner of the printer as shown in Figure 7−1.
3. Slide the entire I/O assembly straight out of the printer until the I/O PCBA is accessible.
4. Remove the 1K ohm resistor packs from the sockets at locations U1 and U3 on the I/O PCBA as shown in Figure 7−1.
5. Plug the 220 ohm resistor pack into the socket at locations U1.
6. Plug the 330 ohm resistor pack into the socket at U2.
7. Slide the I/O assembly back into the printer.
8. Replace the I/O panel and secure it with the six screws.
9. Reconnect the ac power cord and turn the printer on.

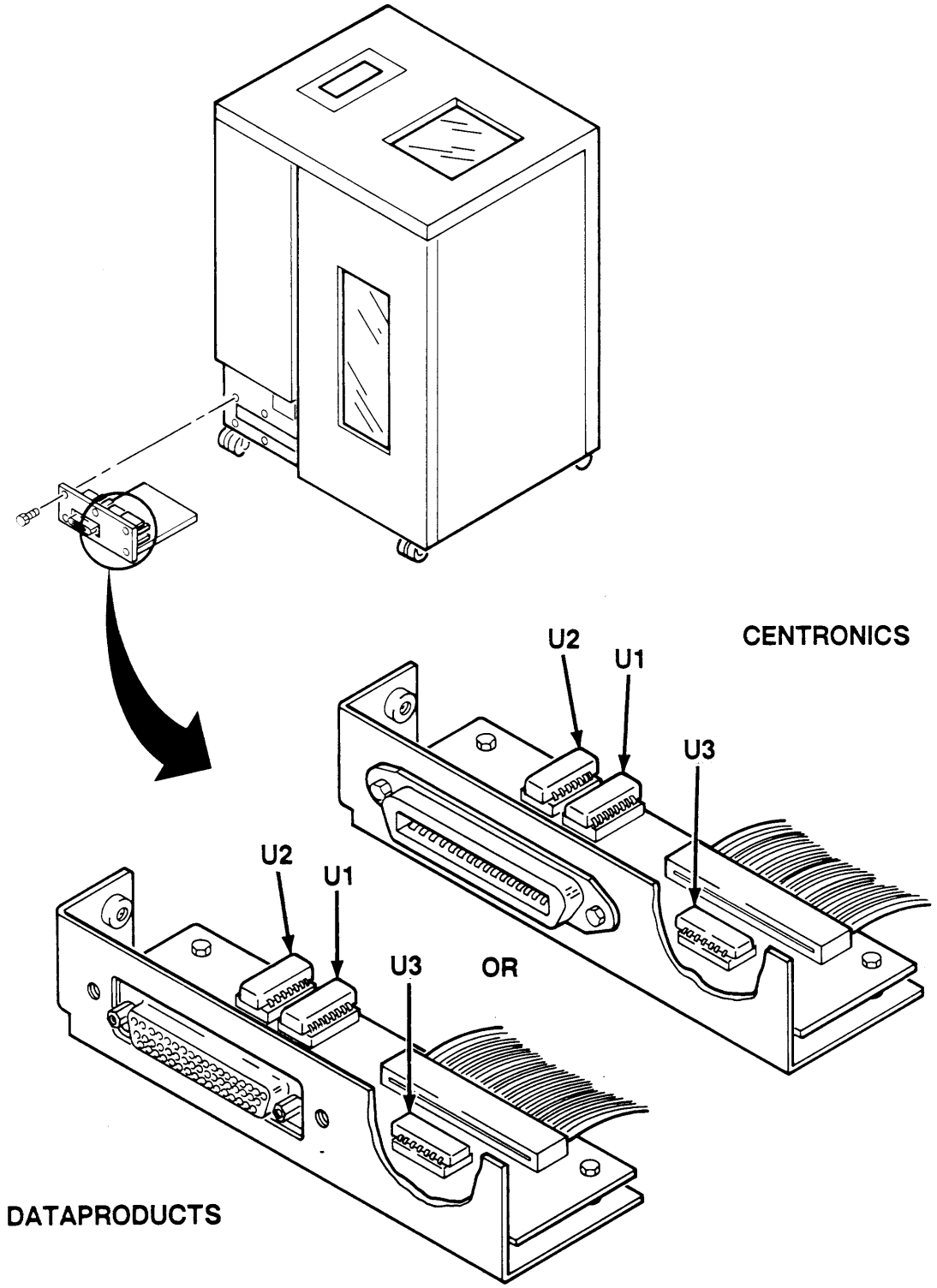


Figure 7−1. Alternate Terminating Resistor Location − Floor Cabinet Model

Pedestal Model

To install the alternate terminating resistors in the pedestal model, perform the following instructions.

1. Turn off the printer and disconnect the ac power cord.
2. Turn the two captive screws at the top of the rear panel to unlock it. Lower the rear panel.
3. Remove the 1K ohm resistor packs from the sockets at locations U1 and U3 on the I/O PCBA located just inside the rear corner of the printer at the I/O connector as shown in Figure 7−2.
4. Plug the 220 ohm resistor pack into the socket at locations U1.
5. Plug the 330 ohm resistor pack into the socket at U2.
6. Raise and secure the rear panel
7. Reconnect the ac power cord and turn the printer on.

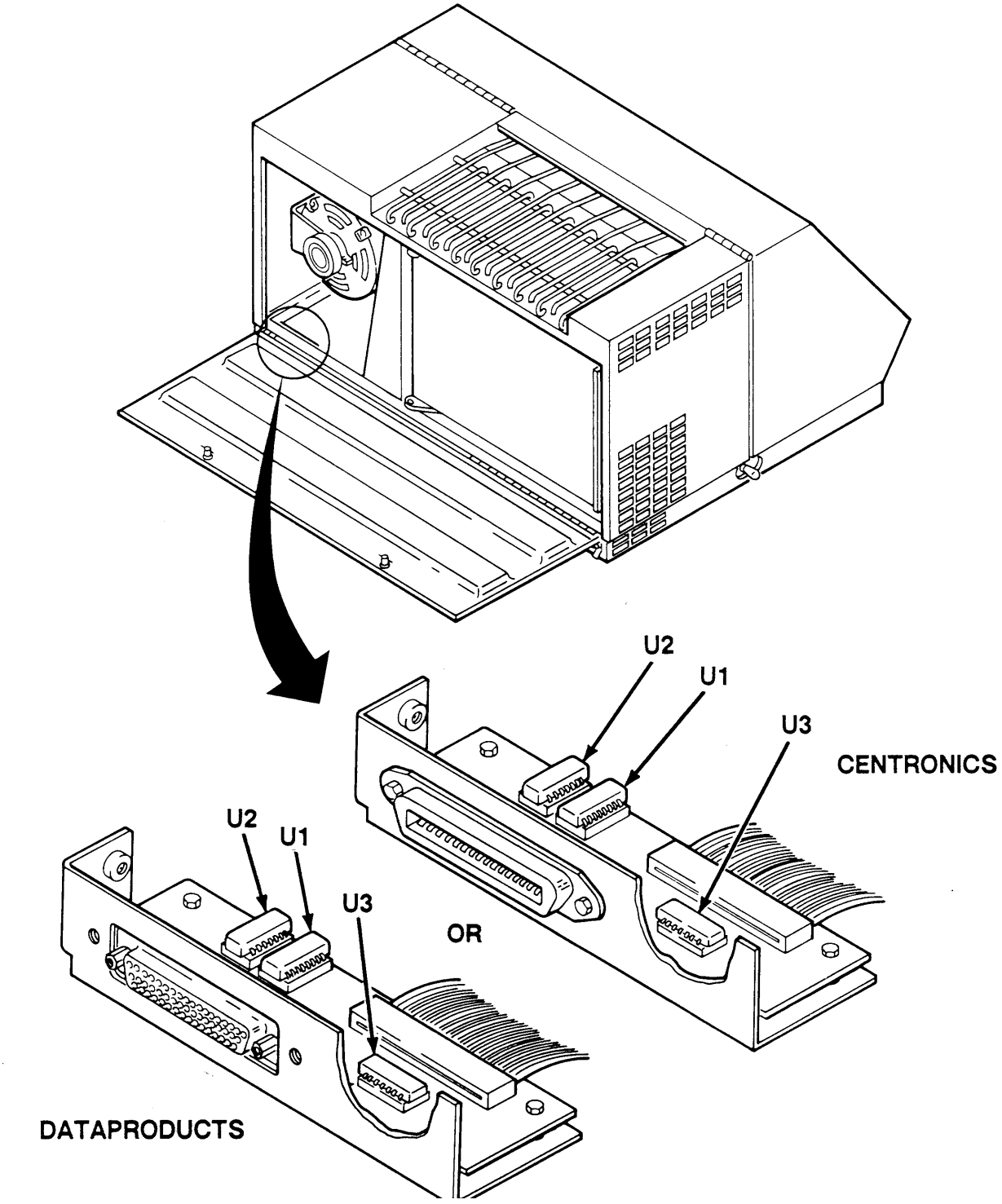


Figure 7−2. Alternate Terminating Resistor Location − Pedestal Model

Interface Jumper Platform

If a change is made from a parallel (Dataproducts or Centronics) to an RS−232 interface or vice versa, the interface jumper platform must be removed, turned around, and reinstalled. The jumper platform must be properly installed for a parallel or RS−232 interface.

The interface jumper platform is located on the C3 logic board at position 6A. Refer to the Hardware Jumper Configuration section in the Configuration chapter for instructions on removing the C3 logic board.

Figure 7−3 illustrates jumper platform orientation. Table 7−4 describes serial or parallel jumper configuration.

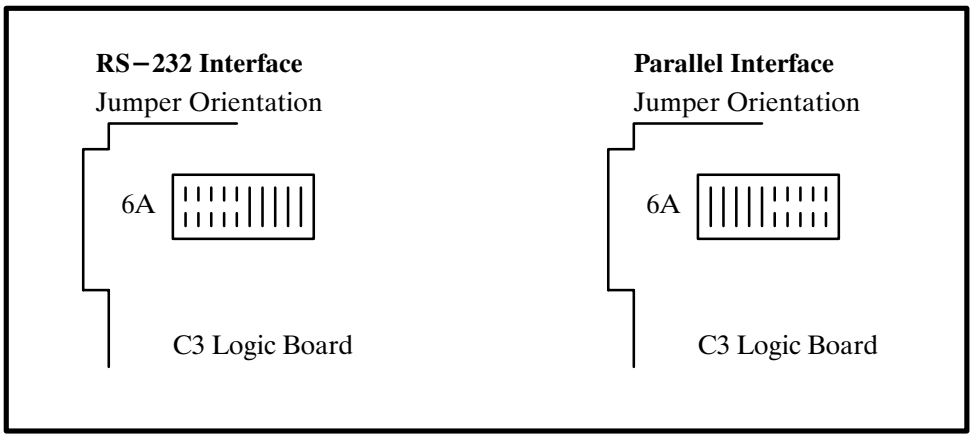


Figure 7−3. Interface Jumper Platform Orientation

Table 7−4. Interface Jumper Configuration

	Jumpers at Location 6A on C3 Logic Board									
Interface Type	**W1**	**W2**	**W3**	**W4**	**W5**	**W6**	**W7**	**W8**	**W9**	**W10**
RS−232	0	0	0	0	0	I	I	I	I	I
Parallel	I	I	I	I	I	0	0	0	0	0
	O = OUT I = IN									

CHAPTER 8

MAINTENANCE

Introduction

The P6000L/P6200L Series printer needs little regular maintenance beyond the scope of general cleaning. Be sure to remove excess paper chaff and dust from the ribbon and paper paths. If print quality or paper motion deteriorates seriously, contact your Field Service Representative for prompt attention.

This chapter presents the following maintenance information:

- General Cleaning
- Fault Messages
- Printer Self−Tests
- Hex Code Printout

General Cleaning

The printer requires periodic cleaning to ensure efficient operation and clear print quality. General cleaning should occur approximately every three months or after 250 hours of operation. If the printer is located in a particularly dusty area or is used for heavy duty printing, a shorter interval for cleaning is required.

❑ CAUTION ❑

Disconnect the power source before cleaning the printer.

Exterior Cleaning

Clean the exterior cabinet with a soft cloth and mild detergent. (Dishwashing liquid works well.) Do not use abrasive powders or strong cleaning agents. The clear window may be cleaned with plain water or mild window cleaner. Always apply the cleaning solution to the cloth; never pour the cleaner directly onto the printer.

Interior Cleaning

Paper chaff and ink accumulation in the interior of the printer is normal during printer operation. However, excessive paper chaff and ink accumulation can degrade printer performance and print quality. Most paper chaff will accumulate around the ends of the platen and ribbon path. To clean the interior of the printer, perform the following steps and refer to Figure 8−1.

1. Fully raise the Forms Thickness Adjustment Lever (A) to open the platen.
2. Remove all paper.
3. Remove the ribbon and spools.
4. Use a soft−bristled brush to clear chaff from the paper path and platen ends (B).
5. With the soft−bristled brush, clean chaff and dust from the ribbon guides (C).
6. Use a vacuum cleaner to clear chaff and dust from the printer base pan (D). Do not use the vacuum on the paper or ribbon path − damage may result.
7. Clean ink or dirt on the platen (E) with a soft cloth lightly moistened with alcohol. Do not let excess alcohol drip into the hammer bank (F).

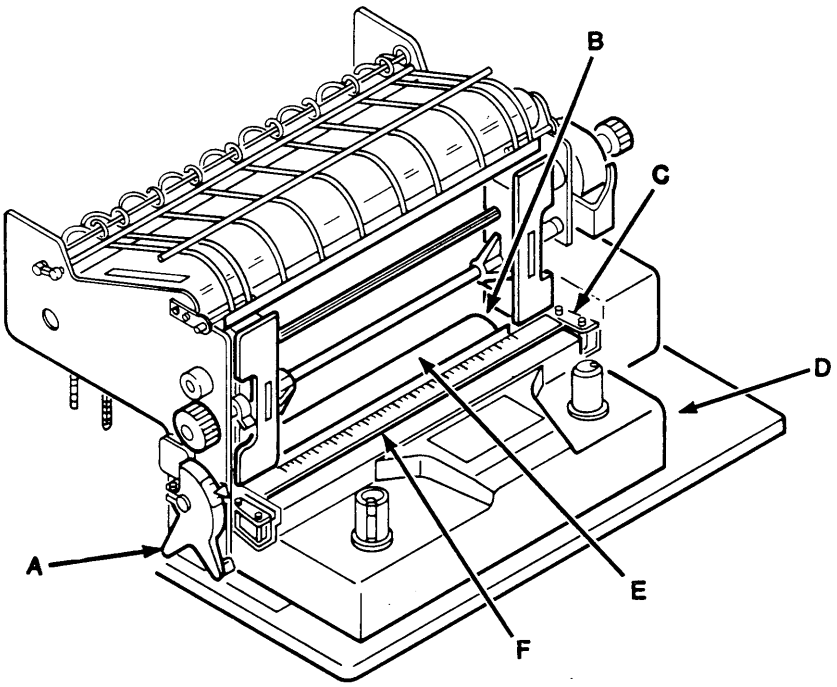


Figure 8−1. Interior Cleaning

Cleaning the Paper Motion Detector

The paper motion detector, located at the bottom of the left tractor gate, checks for jammed or misloaded paper. If excessive chaff or dust accumulates in this area, normal operation may be interrupted.

To clean the paper motion detector, perform the following steps and refer to Figure 8−2.

1. Open the left tractor gate (A).
2. Clear the paper chaff and dust from the paper motion detector (B) with a soft−bristled brush.
3. Close the tractor gate.

After all cleaning is completed, reload paper and ribbon, return the Forms Thickness Adjustment Lever to the appropriate position, reconnect the power, and turn the printer on.

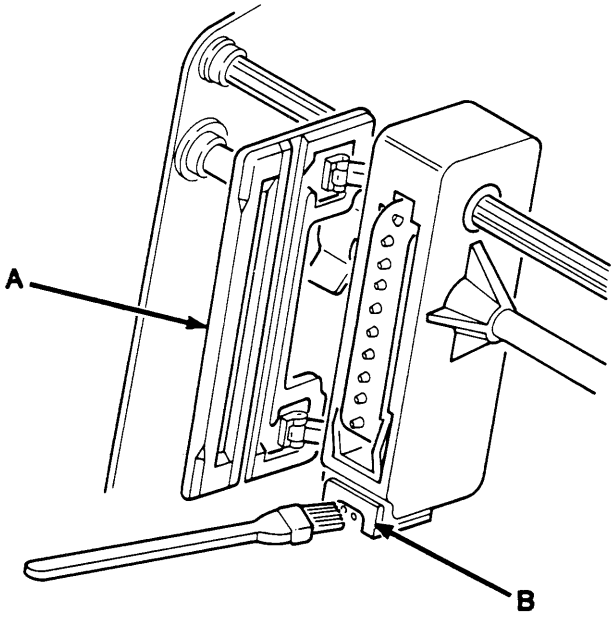


Figure 8−2. Cleaning the Paper Motion Detector

Printer Self−Tests

The printer contains several sophisticated self−tests that can be helpful in maintaining optimum printer performance. Each of these tests may be initiated from the control panel while in the PRINTER TEST 8 INCH WIDTH or FULL WIDTH menus. Currently available self−tests are:

- Shift Recycle
- All E's
- E plus TOF
- All H's
- Underline Only
- Black Plot
- Shuttle/Ribbon

Shift Recycle − a "sliding" alphanumeric pattern useful in identifying missing or misformed characters, improper vertical alignment, or vertical compression.

All E's − a pattern of all uppercase letter E's useful in identifying missing characters, misplaced dots, smeared characters, or light/dark character variations.

E plus TOF − a pattern of all E's followed by a form feed useful in identifying paper motion or feeding problems.

All H's − a pattern of all uppercase letter H's useful in missing characters, misplaced dots, smeared characters, or improper vertical alignment.

Underline Only − an underline pattern useful in identifying vertical misalignment.

Black Plot − Solid black plot printed at unidirectional plot speed useful in identifying misaligned hammers.

Shuttle/Ribbon − a test to exercise shuttle and ribbon action to verify proper operation.

Running the Self−Tests

To run the self−tests:

1. Place the printer offline.
2. Repeatedly press CONFIG MENU until DIAGNOSTICS is displayed.
3. Press CONFIG VALUE; CONFIGURATION PRINTOUT will be displayed.
4. Repeatedly press CONFIG MENU until either INCH WIDTH or FULL WIDTH is displayed.
5. Repeatedly press CONFIG VALUE until the appropriate test is displayed.
6. Press RUN/STOP TEST to begin the test; press RUN/STOP TEST again to stop the test.
7. Repeatedly press CLEAR FAULT to place the printer offline. Place the printer on line.
8. Place the printer on line.

Hex Code Printout

To verify a proper host computer to printer interface, the data stream sent from the host can be printed in hexadecimal code with ASCII character equivalents. The hex code printout, or hex dump, provides a listing of ASCII character data sent from the host with their corresponding two−digit hex code. Nonprintable characters are indicated with a period symbol. A “p” before the hex code indicates an active Paper Instruction (PI) line; a blank space before the hex code indicates an inactive PI line. To print the data stream sent from the host computer in hex code with ASCII character equivalents, perform the following steps.

1. Place the printer offline.
2. Repeatedly press CONFIG MENU until the DIAGNOSTICS message is displayed.
3. Press CONFIG VALUE; CONFIGURATION PRINTOUT will be displayed.
4. Press CONFIG MENU; PRINT STREAM DATA IN HEX CODE will be displayed.
5. Press RUN/STOP TEST; the display will be OFFLINE HEX DUMP
6. Press ONLINE; the display will indicate ONLINE HEX DUMP
7. Send the data from the host; the hex dump will print.
8. Press ONLINE again to stop the hex dump. Press RUN/STOP TEST to exit HEX DUMP.
9. Repeatedly press CLEAR FAULT to place the printer off line.
10. Place the printer on line.

Fault Messages

If a problem should arise, the printer displays certain fault messages. These messages indicate the nature and location of user and service correctable errors. These message and their explanations are listed in Table 8−1. After indicated fault has been corrected, press CLEAR FAULT to return to ONLINE.

Table 8−1. Fault Messages

DISPLAY	OPERATOR CORRECTABLE	EXPLANATION	CORRECTIVE ACTION
FAULT CONDITION PAPER OUT	Yes	Paper Out	Add paper
FAULT CONDITION PLATEN OPEN	Yes	Platen Open	Close the platen by setting the Forms Thickness Adjustment Lever to the correct position for the paper used.
FAULT CONDITION PAPER JAM	Yes	No Paper Motion	Check for and remove any jammed paper in the paper path.
FAULT CONDITION RIBBON	Yes	Ribbon Fault	Verify ribbon movement during operation.
FAULT CONDITION CHANGE RIBBON	Yes	RibbonMinder Message	Install a new ribbon
FAULT CONDITION SHUTTLE STALL	Yes	Shuttle not operating at proper speed	If this occurs frequently, contact an authorized service representative.
FAULT CONDITION POWER SUPPLY	No	DC Power Supply Fault	Contact an authorized service representative.
FAULT CONDITION PROGRAM PROM	No	Upper/Lower program PROM error	Contact an authorized service representative.
FAULT CONDITION FONT PROM	No	Upper/Lower font PROM error	Contact an authorized service representative.
FAULT CONDITION RAM	No	Upper/Lower system RAM error	Contact an authorized service representative.

CHAPTER 9

RIBBONMINDER ™

Introduction

The RibbonMinder function ensures quality printing by determining when a ribbon should be changed. The RibbonMinder (patent pending) monitors the consumption of ink from the ribbon by analyzing the printer's hammer action. It is designed to alert the operator before the print quality falls below a certain level. The function's parameters can be set to meet the specific requirements of any job. In this way, the operator can determine at what level print quality is no longer acceptable. When the print quality reaches this point, a WHEN WORN ACTION will occur. The printer can either stop printing at this point or display a message indicating that it is time to change the ribbon. Replacing the ribbon when the WHEN WORN ACTION occurs will prevent the production of unreadable documents and bar codes.

This chapter provides step by step instructions that facilitate use of the RibbonMinder function. Application hints and shortcuts are included at the end of the chapter. Words and phrases which are in all capital letters correspond to the actual buttons on the printer control panel and messages that appear in the display.

Overview

The RibbonMinder operates very much like the fuel gauge on an automobile. In a car, the fuel gauge lets you know how much fuel remains. With RibbonMinder, the message display on the printer control panel shows you how much usable ink remains in the ribbon.

This function performs without operator attention once it has been initially set up. It may also be controlled through an interface with a host computer. These features of the RibbonMinder function make it virtually autonomous and less prone to errors.

When the ribbon is new, the message display on the printer control panel indicates the ribbon life is at 100%.

ON LINE	100%
DP AT 10 CPI	*

Typical new ribbon display

As printing continues, the percentage of usable ink remaining in the ribbon will continue to fall.

ON LINE	74%
DP AT 10 CPI	*

Ribbon ink is being consumed

ON LINE	8%
DP AT 10 CPI	*

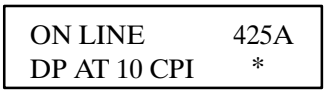
Ribbon life is approaching end

The RibbonMinder feature will detect when no usable ink remains. The message display will indicate 0% and the printer will alert the operator. At this point, the printer is typically configured to stop printing, declare a RIBBON FAULT, and inform the operator to CHANGE RIBBON.

CHANGE RIBBON message at 0%

Finally, the RibbonMinder allows the operator to set a new JOB RATE value to the next job. This value is based on the type of job to be run by the printer. The RibbonMinder also provides an ANALYZE JOB mode which allows the operator to easily calibrate the RibbonMinder for each job that the printer will run, in order to establish the value of the JOB RATE.

SET JOB RATE menu



ANALYZE JOB RATE display

Analyzing a Job

Every job needs to be analyzed to determine its JOB RATE. The JOB RATE must be set for the RibbonMinder function to work correctly. The JOB RATE describes the rate at which a job wears out the ribbon. JOB RATE values can range from 0 (very little wear) to 1000 (the highest possible rate of ink consumption). It is only necessary to analyze a JOB RATE once, provided the JOB RATE is recorded for future use.

Refer to the RibbonMinder configuration diagrams at the end of this chapter to become familiar with the menu structure and the display prompts. To analyze a job:

1. Unlock the Control Panel

   Place the printer OFFLINE. Unlock the printer configuration by simultaneously pressing CONFIG MENU and RUN/STOP until the message CONFIGURATION UNLOCKED appears briefly in the display window.

   ```
   CONFIGURATION
   UNLOCKED
   ```

2. Enable the RibbonMinder Monitor Feature

   From the OFFLINE READY display, enter the ENABLE/DISABLE submenu by consecutively pressing CONFIG MENU, CONFIG VALUE, and CONFIG MENU repeatedly until ENABLE/DISABLE appears on the display. Press CONFIG VALUE twice to display ENABLE ACTION. Each time you press CONFIG VALUE at this level, the function will switch between ENABLED and DISABLED. Press RUN/STOP. If the asterisk does not appear, refer to the Application Hints section.

   ```
   RIBBON LIFE      1000
   ENABLE ACTION    *
   ```

3. Enter Analyze Job Mode

   Enter the ANALYZE JOB submenu by consecutively pressing CLEAR FAULT and then CONFIG MENU. Press CONFIG MENU repeatedly until ANALYZE JOB appears on the display.

   ```
   RIBBON LIFE
   ANALYZE JOB
   ```

4. Enable Analyze Job Mode

   Press RUN/STOP. The following message should appear in the display window. A message to change to a new ribbon will appear if you have not just previously changed the ribbon.

   ```
   RIBBON LIFE   1000
   CHANGE RIBBON
   ```

5. Select When Worn Action

Enter the WHEN WORN ACTION menu by consecutively pressing CLEAR FAULT, CONFIG MENU. Press CONFIG VALUE once to choose STOP PRINTER action, twice to choose AUD/VIS ALARM action, or three times to choose VISUAL ALARM action. The selection will appear in the display with the RIBBON LIFE job rate. Press RUN/STOP after the correct option appears in the display. If the asterisk does not appear, refer to the Application Hints section.

RIBBON LIFE 1000 AUD/VIS ALARM *	Display if Aud/Vis alarm is chosen
RIBBON LIFE 1000 VISUAL ALARM *	Display if visual alarm is chosen
RIBBON LIFE 1000 STOP PRINTER *	Display if stop printer is chosen

6. Select Ribbon Size

If your printer is in the OFFLINE mode, enter the SET RIBBON SIZE submenu by consecutively pressing CONFIG MENU, CONFIG VALUE and then CONFIG MENU repeatedly until SET RIBBON SIZE appears on the display. Press CONFIG VALUE to display the correct ribbon size. The RIBBON SIZE is the actual capacity of the ribbon. The most common ribbon size is 60 yards long with a spool diameter of approximately 4 inches. If, for example, the new ribbon is 100 yards long, the capacity value is 100. Press CONFIG VALUE to increment the size until the desired value is reached. Press RUN/STOP. If the asterisk does not appear, refer to the Application Hints section. The following illustrates a sample SET RIBBON SIZE display:

CURRENT 60 NEW SIZE 60*

7. Install a New Ribbon

Install a new ribbon of an appropriate size for the job before you start to analyze a new job. Press CLEAR FAULT to clear any fault conditions that occurred while changing the ribbon.

OFFLINE 1000A READY

8. Begin Printing Job

Press ONLINE to begin your job printing. The analysis number will begin at 1000A with a fresh ribbon, and will begin to decline as the ribbon becomes worn. Typically, the number will not begin to decrease until more than 200 pages are printed.
The same job can be printed repeatedly in order to compute a JOB RATE. The ribbon should be used to the point where the operator decides that ribbon replacement is neces-

sary. The ribbon should be considered worn out if the print quality of any part of the page is unacceptable. The following is a typical message display after considerable ink consumption.

ON LINE	400A
DP AT 10 CPI	*

9. End of Ribbon Life Reached

When the quality of the print is no longer acceptable, press ONLINE again to stop the printer. If the message indicates there is DATA in the BUFFER, press PAPER ADVANCE to finish printing the data.

OFFLINE	400A
READY	

10. Record the Job Rate

The calculated JOB RATE value is continuously shown on the display. While a job is being analyzed, the JOB RATE is displayed with an "A" after it. Record the JOB RATE value for future use. To enter this calculated JOB RATE for the RibbonMinder use, enter the SET JOB RATE submenu by consecutively pressing CONFIG MENU, CONFIG VALUE, CONFIG MENU, CONFIG VALUE, from the OFFLINE READY prompt.

ANALYZE JOB	
NEW RATE	400

Press RUN/STOP to enter this rate as the new job rate. The display message will remind you to change the ribbon.

CURRENT	400
CHANGE RIBBON	

11. Replace Worn Ribbon

Install a new ribbon once the ribbon becomes worn. Press CLEAR FAULT to clear the PLATEN OPEN fault message.

OPTIONAL: To lock the printer configuration, press CONFIG MENU and RUN/STOP simultaneously until the message in the display window indicates that it has been locked.

Running a Job

The RibbonMinder function works without attention once it has been initially set up for a job. To do this, perform the following instructions and refer to the diagram at the end of this chapter.

1. Replace Ribbon if Worn

   Install a new ribbon if the ribbon life is 0% or negative, or if the RibbonMinder function has been disabled.

2. Unlock the Control Panel

   If not at the OFFLINE READY prompt, press CLEAR FAULT until OFFLINE READY appears. Unlock the printer configuration by simultaneously pressing CONFIG MENU and RUN/STOP, until the CONFIGURATION UNLOCKED prompt appears briefly in the display.

CONFIGURATION UNLOCKED

3. Enable the RibbonMinder Monitor Feature

   From the OFFLINE READY display, enter the ENABLE/DISABLE submenu by consecutively pressing CONFIG MENU, CONFIG VALUE, and CONFIG MENU repeatedly until ENABLE/DISABLE appears on the display. Press CONFIG VALUE twice to display ENABLE ACTION. Each time you press CONFIG VALUE at this level, the function will switch between ENABLED and DISABLED. Press RUN/STOP. If the asterisk does not appear, refer to the Application Hints section.

RIBBON LIFE	1000
ENABLE ACTION	*

4. Enter the SET JOB RATE

   Press CLEAR FAULT and then CONFIG MENU repeatedly until SET JOB RATE appears on the display. Press CONFIG VALUE to display the current job rate. The display message will now show the value last selected.

CURRENT	400
NEW RATE	400*

5. Select New JOB RATE

   Select the appropriate JOB RATE by pressing CONFIG VALUE until the correct JOB RATE appears in the display. This JOB RATE is obtained by analyzing the job. Press RUN/STOP to enter this JOB RATE. If the NEW RATE value displayed is larger than desired, the display will decrement the NEW RATE by simultaneously pressing CONFIG VALUE and CONFIG MENU. Press and hold to quickly advance the count. An asterisk next to the selection indicates that it has been entered. If an asterisk does not appear, refer to the Application Hints section.

6. Choose the WHEN WORN ACTION

To enter the WHEN WORN ACTION menu press CLEAR FAULT, CONFIG MENU repeatedly until WHEN WORN ACTION appears on the display. This mode allows you to choose what printer action will occur when the ribbon life reaches 0%

To select the STOP PRINTER action when the ribbon is worn, press CONFIG VALUE, RUN/STOP.

RIBBON LIFE 100% STOP PRINTER *

To select the AUDIO/VISUAL ALARM action when the ribbon is worn, press CONFIG VALUE twice, RUN/STOP.

RIBBON LIFE 100% AUD/VIS ALARM *

To select the VISUAL ALARM action, press CONFIG VALUE three times, RUN/STOP.

RIBBON LIFE 100% VISUAL ALARM *

7. Reset for a New Ribbon

If a new ribbon was not installed, skip this step. If a new ribbon was installed and is the same size as the previous one, enter the new ribbon menu by pressing CLEAR FAULT and continue to press CONFIG MENU until the message NEW RIBBON appears. Press CONFIG VALUE, RUN/STOP.

RIBBON LIFE 100% NEW RIBBON

8. Check for Proper Ribbon Size

If the new ribbon is a different size than the previous one, consecutively press CLEAR FAULT and then CONFIG MENU until SET RIBBON SIZE appears on the display. Press CONFIG VALUE to display the current size. The display message will be CURRENT XXXX NEW SIZE XXXX. Select the appropriate value by pressing CONFIG VALUE until the number appears in the display window. Press RUN/STOP to enter this new value. The following message should appear in the display window. A message to change the ribbon will appear if you have just changed the ribbon.

CURRENT 60 CHANGE RIBBON

9. Optional Saving of Parameters

   Save the parameters for this job by pressing CONFIG MENU until the message reads SAVE PARAMETERS. Press RUN/STOP to make the VALUES SAVED message appear briefly.

SAVE PARAMETERS VALUES SAVED	Message appears briefly

10. Optional Relocking of Control Panel

    Lock the CONTROL PANEL OPERATION by pressing CONFIG MENU and RUN/STOP simultaneously until the message appears briefly indicating that the menu has been locked.

CONFIGURATION LOCKED	Message appears briefly

11. Go On Line to Begin Printing

    Press ONLINE to begin printing. Notice the 100% ribbon life value in the upper right corner of the display. This display shows the remaining usable ribbon life as the job progresses. The ribbon life will decrease as the ribbon consumes ink. The following example illustrates the display as the job progresses:

ON LINE 95% DP AT 10 CPI *

12. When Ribbon Life Reaches 0%

    Printing can continue until the remaining usable ink reaches 0%. At this point, if the STOP PRINTER action has been selected, the printing will stop, the printer will go off line, and a CHANGE RIBBON message will appear in the display on the control panel.

FAULT CONDITION CHANGE RIBBON

13. Replace Ribbon

    Open the Paper Thickness Lever (platen). Remove the old ribbon. Install a new ribbon and return the Paper Thickness Lever to its proper setting. Press CLEAR FAULT. The ribbon life percentage to reset to 100%.

OFFLINE 100% READY

14. Continue Printing the Job

    Press ONLINE to resume printing the job. The RibbonMinder will continue to monitor ink consumption and will display the remaining ribbon life.

Multiple Jobs on the Same Ribbon

The RibbonMinder function may be used to run more than one job on the same ribbon. To do this, the JOB RATE of each job must be known before printing. To use the function with more than one job and more than one JOB RATE, follow the procedures for initially setting up the RibbonMinder function. At the completion of each job, change the JOB RATE before starting the new job.

To use the RibbonMinder function with more than one job:

1. Unlock Printer Configuration

   If the printer configuration is currently locked, place the printer OFFLINE. Unlock the printer configuration by pressing CONFIG MENU and RUN/STOP simultaneously until the message CONFIGURATION UNLOCKED appears briefly in the display window.

CONFIGURATION UNLOCKED	Message appears briefly

2. Enter SET JOB RATE mode

   Use CONFIG MENU and CONFIG VALUE to enter the SET JOB RATE.The CURRENT VALUE at this point corresponds to the previous job.

CURRENT	375
NEW RATE	375*

3. Change to New Rate

   Set the NEW RATE value to equal the rate of the next job. The CONFIG VALUE switch will increase the value of the NEW RATE. Pressing CONFIG MENU and CONFIG VALUE simultaneously will decrease the value of the NEW RATE

CURRENT	375
NEW RATE	280

4. Select the NEW RATE value

   Press RUN/STOP to enter this new value. The JOB RATE can also be sent from a host computer.

CURRENT	280
NEW RATE	280*

5. Optionally Relock the Printer Configuration

   In order to prevent unauthorized changes to the RibbonMinder JOB RATE, relock the PRINTER CONFIGURATION. To lock the printer configuration, go to OFFLINE and press CONFIG MENU and RUN/STOP simultaneously until a message indicates that it has been locked.

Changing a Ribbon Early

Occasionally, a ribbon malfunctions and needs to be replaced prior to its ink being completely consumed. This may occur with ribbons that have snagged or have folded. Whenever the need to change a ribbon early arises, replace the bad ribbon with a new one and reset the ribbon life to 100% by using the following procedure:

1. Enter NEW RIBBON mode

   Place the printer OFFLINE. Use CONFIG MENU and CONFIG VALUE to reach the NEW RIBBON submenu. Ignore any brief messages that indicate CONFIGURATION LOCKED. The printer configuration does not have to be unlocked for an operator to reset the ribbon life for a new ribbon.

   ```
   RIBBON LIFE   43%
   NEW RIBBON
   ```

2. Reset for New Ribbon

   Press RUN/STOP to reset for a new ribbon. The display message will request you to change the ribbon at this time.

   ```
   RIBBON LIFE   100%
   CHANGE RIBBON
   ```

3. Install New Ribbon

   Install a new ribbon and press CLEAR FAULT to clear any fault conditions that occurred while changing the ribbon.

   ```
   OFFLINE       100%
   READY
   ```

4. Continue Printing

   Continue printing the interrupted job by placing the printer ONLINE.

Host Interface

The RibbonMinder function can be controlled from a host computer through the host interface.

The following control sequences may be used from the host computer. If the printer is emulating a serial matrix printer, substitute ESC for SOH.

SOH r J NNNN E	To SET JOB RATE NNNN is the JOB RATE value between 0 and 1000 expressed as a decimal number having between one and four digits. Each individual digit of the value is represented by the corresponding hex code. For example, if the JOB RATE value is 341, NNNN will be the ASCII characters 3 (33 hex), 4 (34 hex), and 1 (31 hex). The control code sequence will be CHR$(1);“rJ341E”; Examples of ASCII Hex values: 01 72 4A 33 34 31 45
SOH r A x	To select WHEN WORN ACTION Where the value of x determines the PRINTER ACTION that will be selected as follows: STOP PRINTER = S (Hex 53) AUD/VIS ALARM = A (Hex 41) VISUAL ALARM = V (Hex 56) Examples of ASCII Hex values: 01 72 41 53
SOH r E	To ENABLE printer action. Examples of ASCII Hex values: 01 72 45
SOH r D	To DISABLE printer action. Examples of ASCII Hex values: 01 72 44

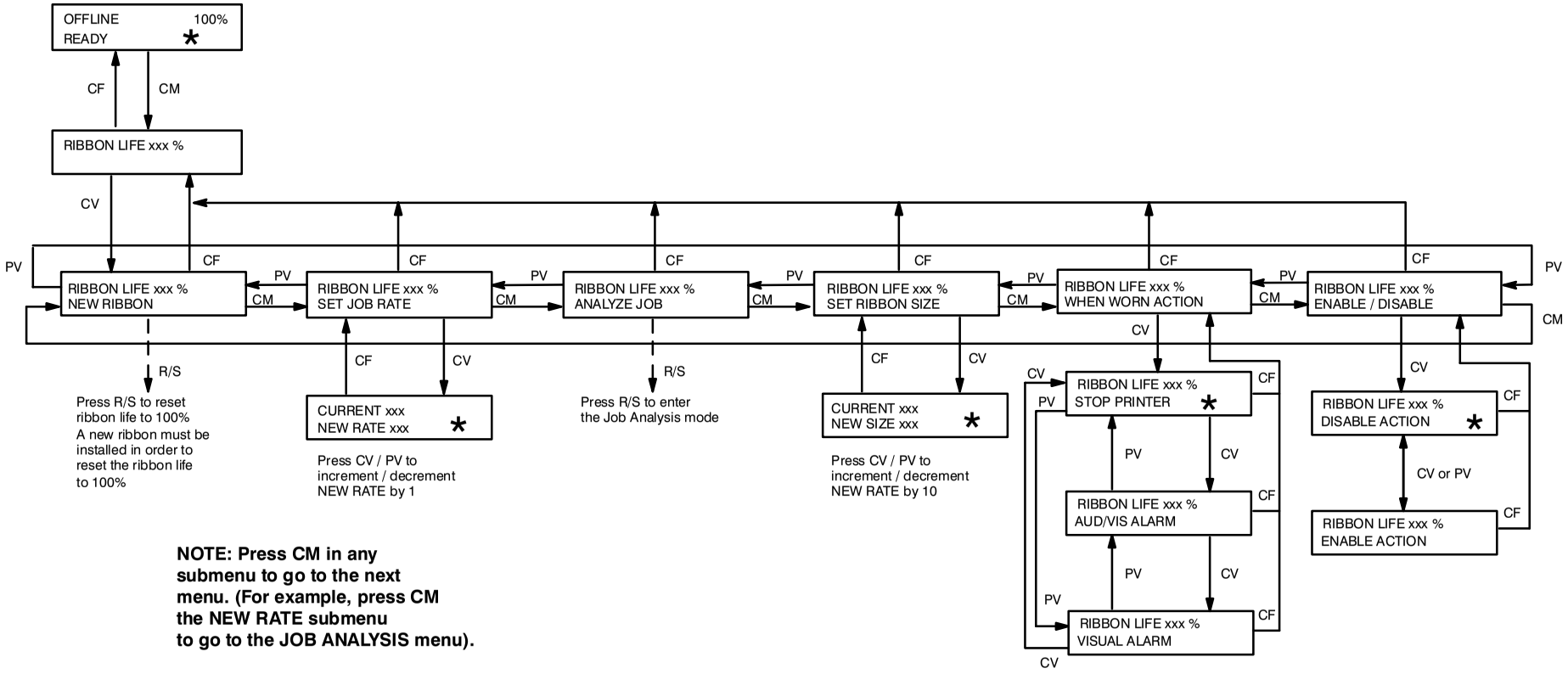
To set up the function for interface with a host:

1. Install a new ribbon.
2. Unlock the printer configuration.
3. Check the ribbon size and change if necessary.

   Optional: Lock the printer configuration.
4. Press ONLINE to begin printing. The commands which supply JOB RATE, WHEN WORN ACTION, and the ENABLE feature must be sent from the host prior to printing. These commands may be sent from a remote computer or embedded in the job before printing the job.

Application Hints

- Parameters cannot be changed from the control panel while the printer configuration is locked. The CONFIGURATION LOCKED message will appear briefly if you attempt to change a parameter that is locked.
- JOB RATES do not change when the ribbon size changes.
- JOB RATES can be changed at any time without causing unacceptable printing quality.
- To decrease a value in the menu, press CONFIG MENU and CONFIG VALUE simultaneously.
- Changing the RIBBON SIZE, by entering a new value and pressing RUN/STOP, will always reset the ribbon life value to 100%.
- JOB RATES must always be determined prior to running a job.
- To clear a CHANGE RIBBON message, you must either change the ribbon and press CLEAR FAULT or DISABLE the function. The CHANGE RIBBON message will reappear once the function is enabled again if the ribbon is worn.
- To return to the OFFLINE/READY prompt, press CLEAR FAULT until the prompt appears in the display window.
- Change the parameters in accordance with each new job.
- Record the JOB RATE determined while analyzing a job. This value is necessary each time the RibbonMinder function is used on a job and may be sent from a host interface as well.
- When analyzing a job, a new ribbon must be installed.
- When changing the ribbon size, a new ribbon must be installed.
- While the RibbonMinder is disabled, the ribbon life value will not be displayed in the ON LINE or OFFLINE states, or in any configuration menu.



NOTE: Press CM in any submenu to go to the next menu. (For example, press CM the NEW RATE submenu to go to the JOB ANALYSIS menu).

CM = CONFIG MENU
CV = CONFIG VALUE
CF = CLEAR FAULT
R/S = RUN/STOP
PV = CONFIG MENU + CONFIG VALUE

PRESSING ONLINE TWICE ALWAYS RETURNS TO OFFLINE.

RibbonMinder Menu Structure

CHAPTER 10

INSTALLATION

Introduction

This document presents the following printer installation procedures. Be sure to read this entire document carefully before installing and operating the printer.

- Power Requirements
- Site Requirements
- Floor Cabinet Model
  - Paper Stacking Chain Assembly Installation
  - Shipping Restraints
- Pedestal Model
  - Pedestal Assembly
  - Table Top Mounting
  - Shipping Restraints
- Cable Connections
- Preliminary Test

❑ CAUTION ❑

It is very important to remove all shipping restraints prior to operation to avoid printer damage. It is also important to install the shipping restraints whenever the printer is moved or shipped to avoid shipping damage.

Power Requirements

A label on the back of the printer next to the power cord indicates the voltage and frequency requirements. The printer must be connected to the specified power source. Line voltage can vary ±±10%. If the line voltage deviates more than 10% during shuttle motor start or operation, the printer power supply should be reconfigured. A field kit for reconfiguring printer voltage and/or frequency requirements is available from *Printronix*. Call your authorized Service Representative for more details. The printer contains primary circuit protection to accommodate the start−up current. Consult an electrician if printer operation affects local electrical lines.

❑ IMPORTANT ❑

P6000L/P6200L Series printers employ a single phase, capacitive start, shuttle motor. 400 lpm models require 14.2 amps and 800 lpm models require 25.4 amps for a duration of 0.5 sec at motor start−up. This is an important power requirement. It is recommended to supply power from a separate ac circuit of 20 amps at 50 or 60 Hz.

Site Requirements

When selecting the location for the printer, consider interface requirements, power requirements, and environmental factors. Select a location with the proper power source available and within the maximum cable length specifications to interface with the host computer. The printer is designed to operate in a relatively dust free environment such as a computer room or business office with an ambient temperature of 41° to 104° F (5° to 40° C) and a relative humidity of 10% to 90%. The site selected for the printer must also allow air to circulate freely all around the printer. A minimum of 3 feet clearance behind the printer should be provided to allow air circulation and easy access to the paper stacking area. Figure 10−1 illustrates the site requirements for floor cabinet model printers. Figure 10−2 illustrates the site requirements for pedestal model printers.

❑ CAUTION ❑

The warranty may be voided if adequate ventilation is not provided. Overheating and serious damage to the printer components can occur if the air vents at the sides and bottom of the printer are blocked.

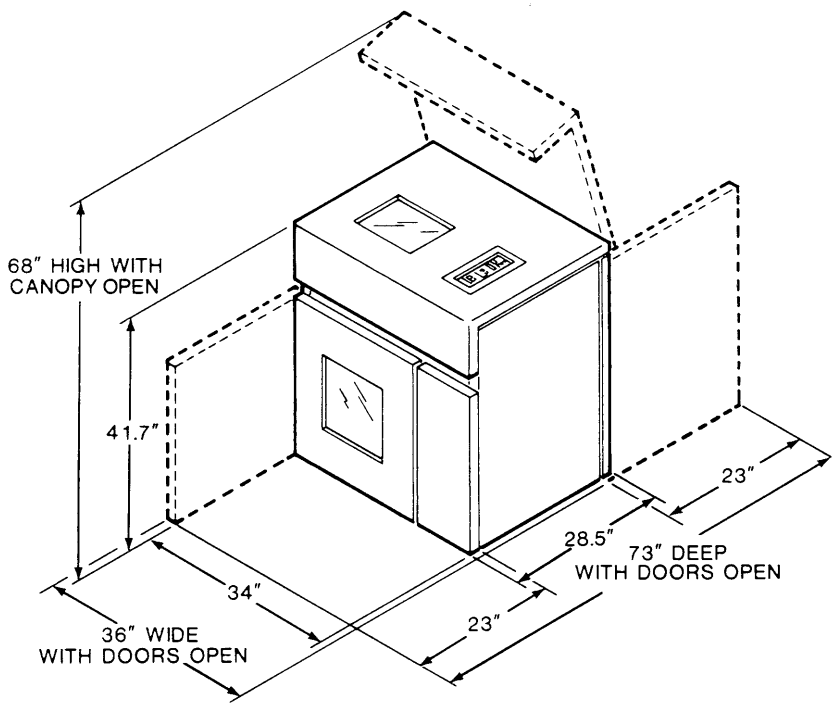


Figure 10−1. Site Requirements − Floor Cabinet Model

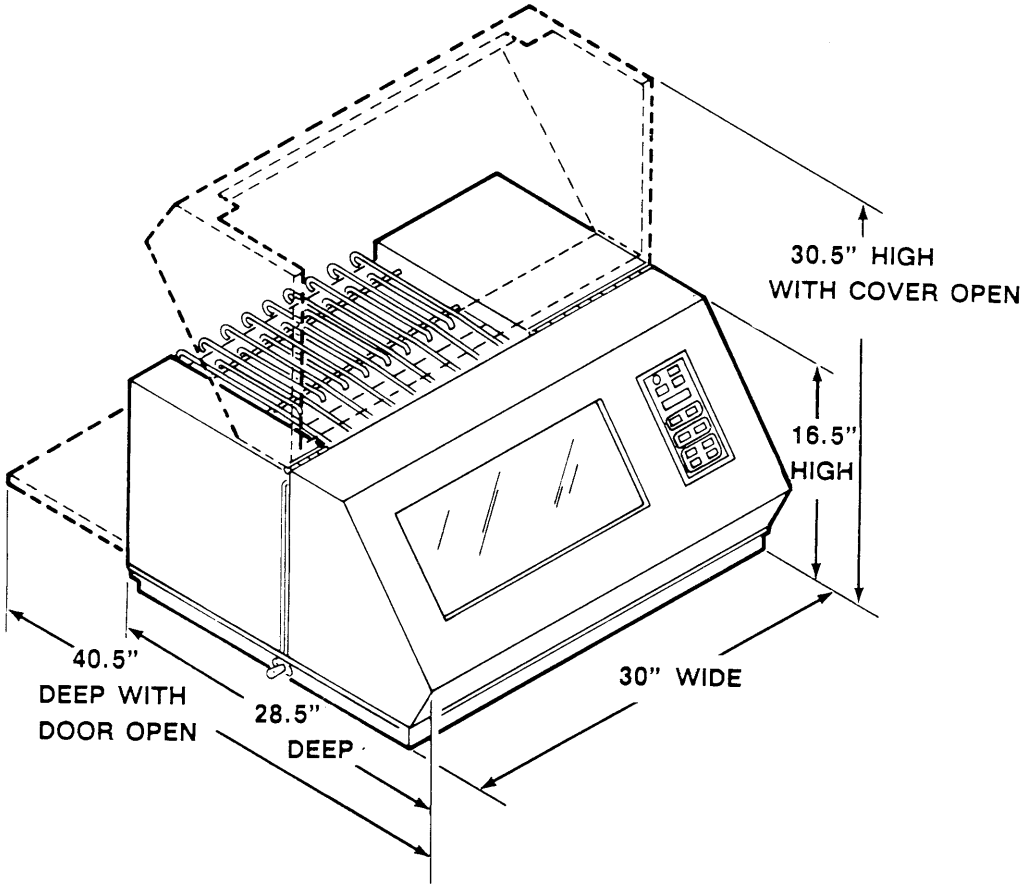


Figure 10−2. Site Requirements − Pedestal Model

Floor Cabinet Model Installation

The following section on Floor Cabinet Model Installation provides information on installing the paper stacking chain assembly and removing the shipping restraints for the P6200L Series printers.

Paper Stacking Chain Assembly Installation

The Paper Stacking Chain Assembly is an aid used on floor cabinet model printers for proper paper stacking. To install the Chain Assembly, refer to the following instructions and Figure 10−3.

1. If paper is loaded in the printer, unload the paper.
2. Open the printer rear door to access the paper stacking area.
3. Hook the bottom of the four (4) long chains to their own rings to form a loop. The long chains must be looped for proper operation.

4. Hook the looped chains by their rings to the front (toward the front of the printer) of the wire paper guide, one chain positioned near each outer edge of the paper path and two chains positioned near the center of the paper path for the paper width used.

5. Hook the four (4) short chains by their rings to the back of the paper guide in positions similar to the front chains.

6. Refer to the Paper Stacking instructions in the Operation chapter to start the paper stacking properly.

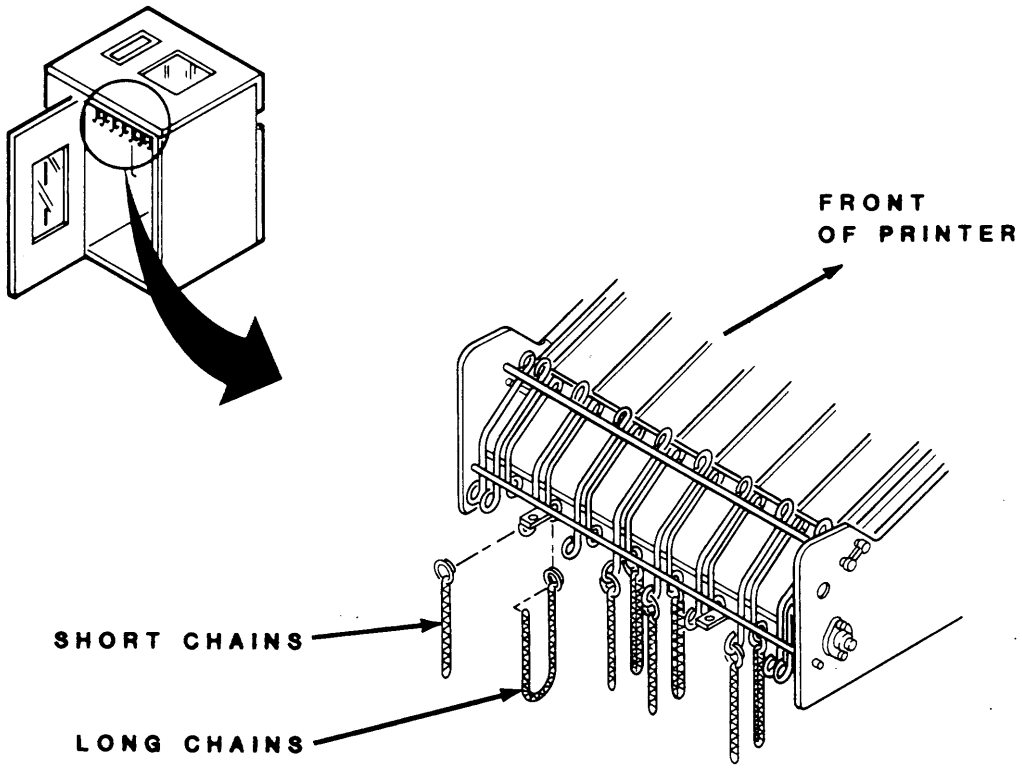


Figure 10−3. Chain Assembly Installation − Floor Cabinet Model

Shipping Restraints Removal

The printer shipping restraints must be removed prior to operation. The following tools are required to remove the shipping restraints from a floor cabinet model:

- 3/32 inch hex wrench
- Phillips head screwdriver
- 3/8” nut driver
- diagonal cutters

Figure 10−4 illustrates the general location of the shipping restraints on the floor cabinet model printer. Platen restraints include two screws (A) and a tie wrap around the Forms Thickness Adjustment Lever (B). Two front shock mount restraint screws (C) and four side shock mount restraint screws secure the entire print assembly to the chassis. Each screw is tagged with a red warning label. After the printer has been placed in position, refer to the following instructions to remove the shipping restraints.

❑ WARNING ❑

Do not connect the ac power source before removing the shipping restraints. If the power has been connected, disconnect it prior to performing the shipping restraint removal procedures to prevent possible injury. In addition, the shipping restraints must be installed whenever the printer or shuttle assembly is shipped or transported to prevent damage.

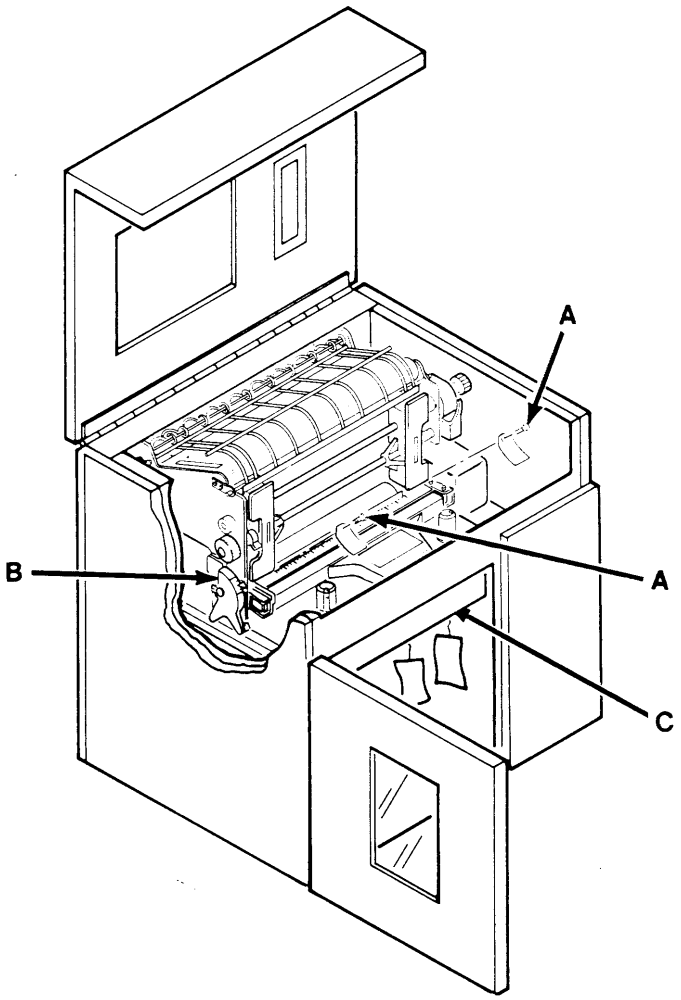


Figure 10−4. Shipping Restraint Locations − Floor Cabinet Model

Platen Restraints Removal

Platen restraints include the platen restraint screws (one at each end of the platen), the Forms Thickness Adjustment lever tie wrap, and the wire paper guide tie wrap. To remove these restraints, perform the following instructions and refer to Figure 10−5.

1. Raise the printer cover.

2. Remove the two platen restraint set screws (A) with the 3/32 inch hex wrench.

3. Cut and remove the tie wrap (B) securing the Forms Thickness Adjustment Lever.

4. Cut and remove the tie wrap securing the paper guide and power cord.

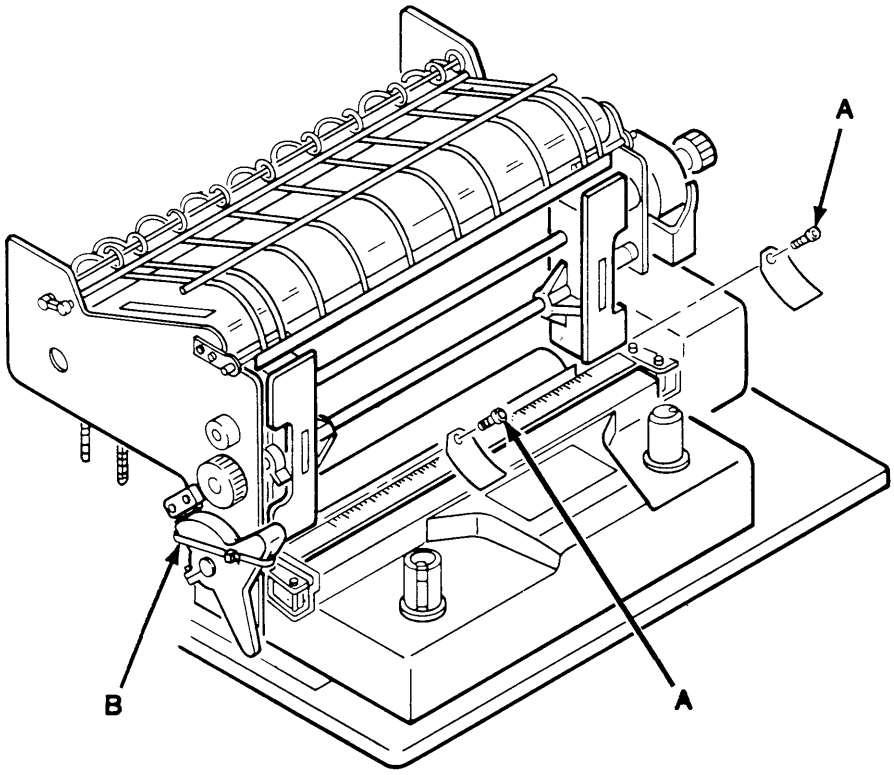


Figure 10−5. Platen Restraint Removal − Floor Cabinet Model

Front Shock Mount Restraint Screw Removal

As shown in Figure 10−6, two of the six shock mount restraint screws (A) are accessed through the front of the printer. The restraint screws are tagged with a red warning label. Open the front cabinet door (B) and remove the restraint screws using the 3/8” nut driver.

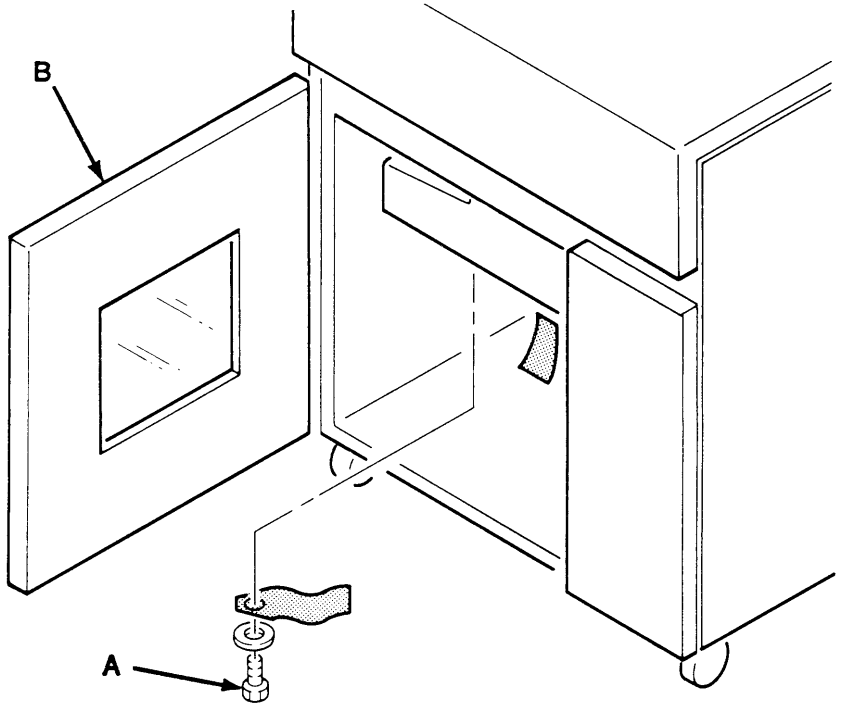


Figure 10−6. Front Shock Mount Restraint Screw Removal − Floor Cabinet Model

Side Shock Mount Restraint Screw Removal

The remaining four shock mount restraint screws are accessed through the right side of the printer by removing the right side panel and lowering the card cage. These procedures are described in this section.

Side Panel Removal − To remove the right side panel, perform the following instructions and refer to Figure 10−7.

1. Raise the printer cover.
2. Disconnect the two ground wire connectors (A) from the corners of the side panel.
3. Loosen the side panel release screw (B) with the Phillips head screwdriver. Do not remove the screw; simply loosen it enough to slide in the notched cutout on the frame.
4. Using both hands, lift the side panel up and out from the bottom edge. The panel fits snugly on four mounting studs (C). First time removal of the side panel may require extra pressure to unseat the studs from the panel keyholes (D).

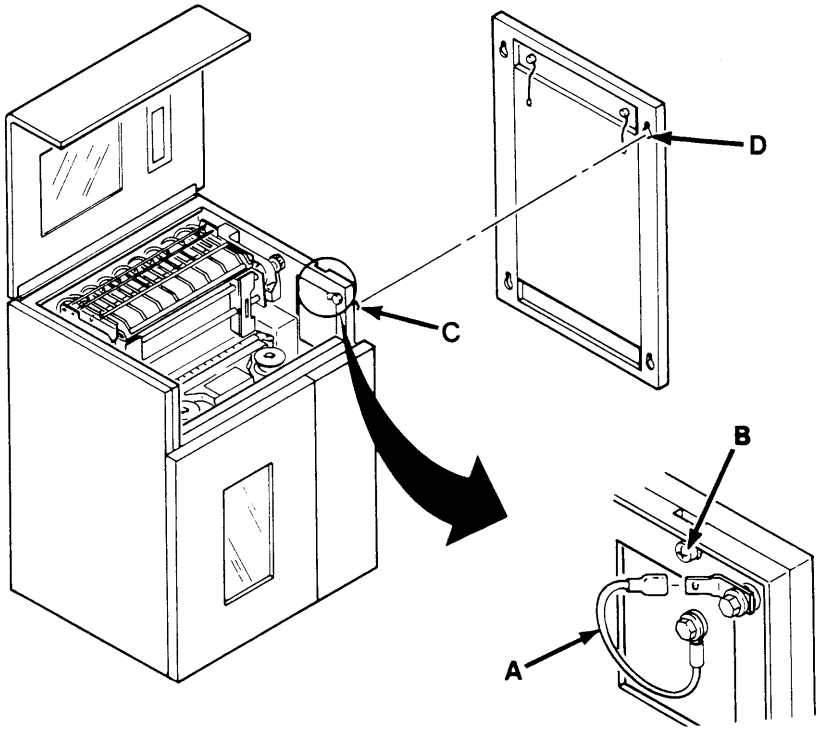


Figure 10–7. Side Panel Removal – Floor Cabinet Model

Lowering the Card Cage – The card cage must be lowered to gain access to the remaining shock mount restraint screws. The card cage is hinged at the bottom to swing out from the printer as shown in Figure 10–8. To lower the card cage (A), loosen, but do not remove, the release wing nut (B) on the right side of the card cage. Gently pull the front edge of the cage down.

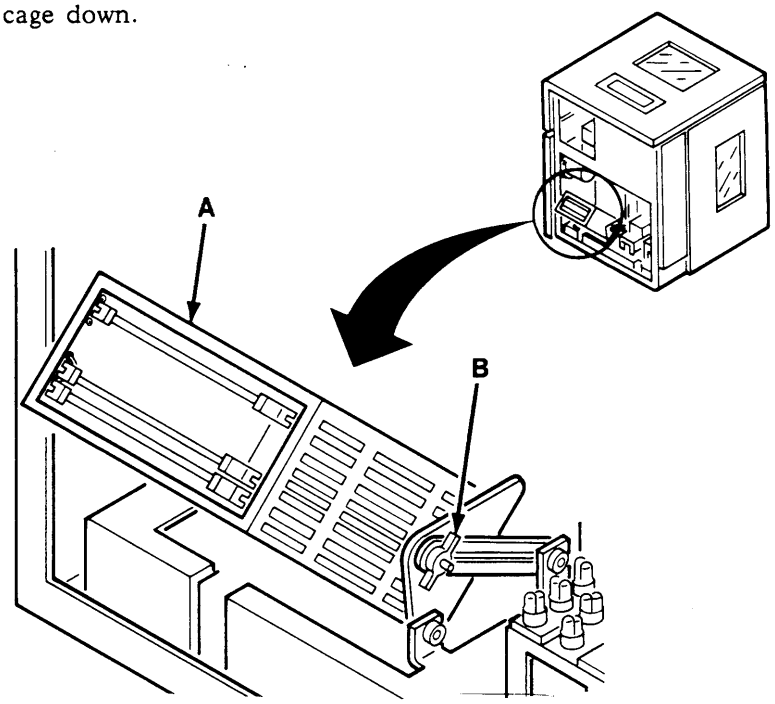


Figure 10–8. Lowering the Card Cage – Floor Cabinet Model

Removing the Side Shock Mount Restraint Screws − After removing the side panel and lowering the card cage, the remaining four shock mount restraint screws can be accessed and removed. Perform the following instructions and refer to Figure 10−9.

1. Remove the left two restraint screws (A) located above the fan housing (B) with the 3/8" nut driver.

   NOTE: A universal joint nut driver may be required to access the screws.

2. Remove the right two restraint screws (C) located to the right of the fan housing (B) with the 3/8" nut driver.

3. After removing the last restraint screw, return the card cage to the full upright position and tighten the wing nut.

4. Replace the side panel. Make sure the mounting studs and side panel release screw are properly seated.

5. Tighten the side panel release screw.

6. Reconnect the ground wire connectors.

7. Lower the printer cover.

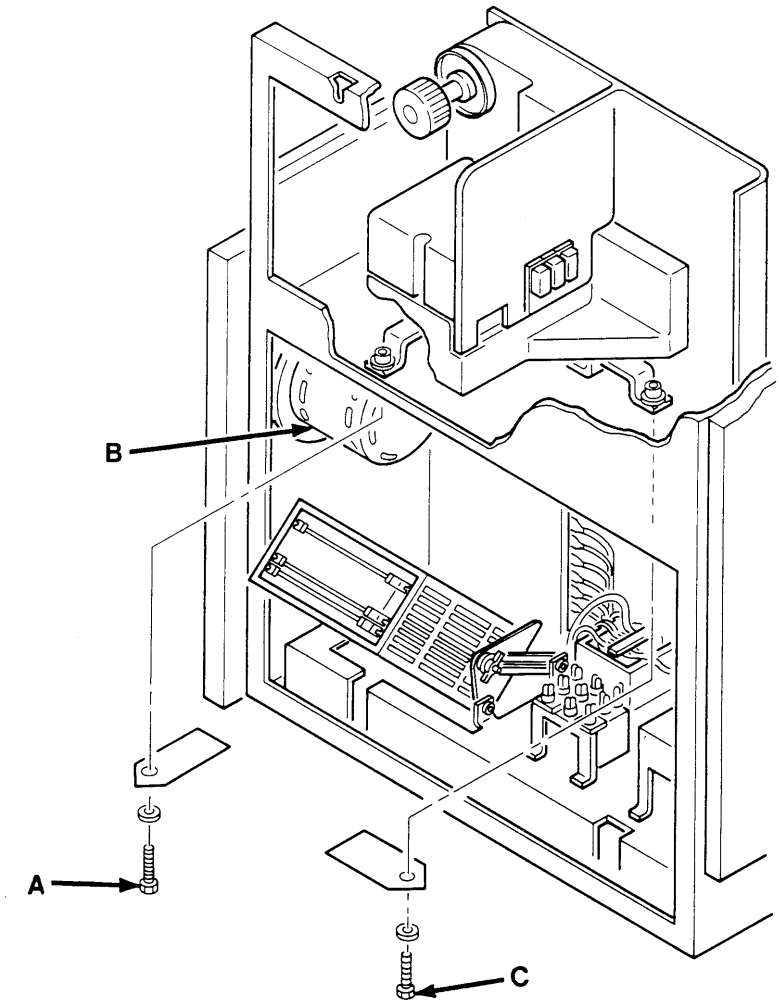


Figure 10−9. Side Shock Mount Restraint Screw Removal − Floor Cabinet Model

Pedestal Model Installation

The following section on Pedestal Model Installation provides information pedestal assembly, table top mounting, and shipping restraints removal for the P6000L Series printers.

Pedestal Assembly

To assemble the optional pedestal for pedestal model printers, perform the following instructions. A 5/16” nut driver and 5/32” hex wrench are required.

1. Verify the pedestal shipping kit contains the following items:
   - 2 pedestal legs
   - 12 machine screws
   - 1 modesty panel
   - 4 flat washers
2. As shown in Figure 10−10, position the back side of the modesty panel (A) against the pedestal legs (B) facing the long end of the leg base. With the 5/16” nut driver, secure the panel to the legs with 4 machine screws (C) on each side of the back of the panel.
3. Place the printer on a sturdy table with 2 of the printer’s rubber feet (D) hanging over the edge of the table as shown in Figure 10−11. Using the 5/32−inch hex wrench, remove the 2 exposed rubber feet. Rotate the printer to expose the remaining 2 rubber feet and remove them.
4. As shown in Figure 10−12, carefully place the printer on the pedestal facing the front. Align the printer’s rubber feet holes (E) with the pedestal mounting holes (F). Install two screws with washers through the pedestal mounting holes on each side to secure the printer to the pedestal.
5. If equipped with the optional paper stacker, refer to the Paper Stacker Information and Assembly Instructions.

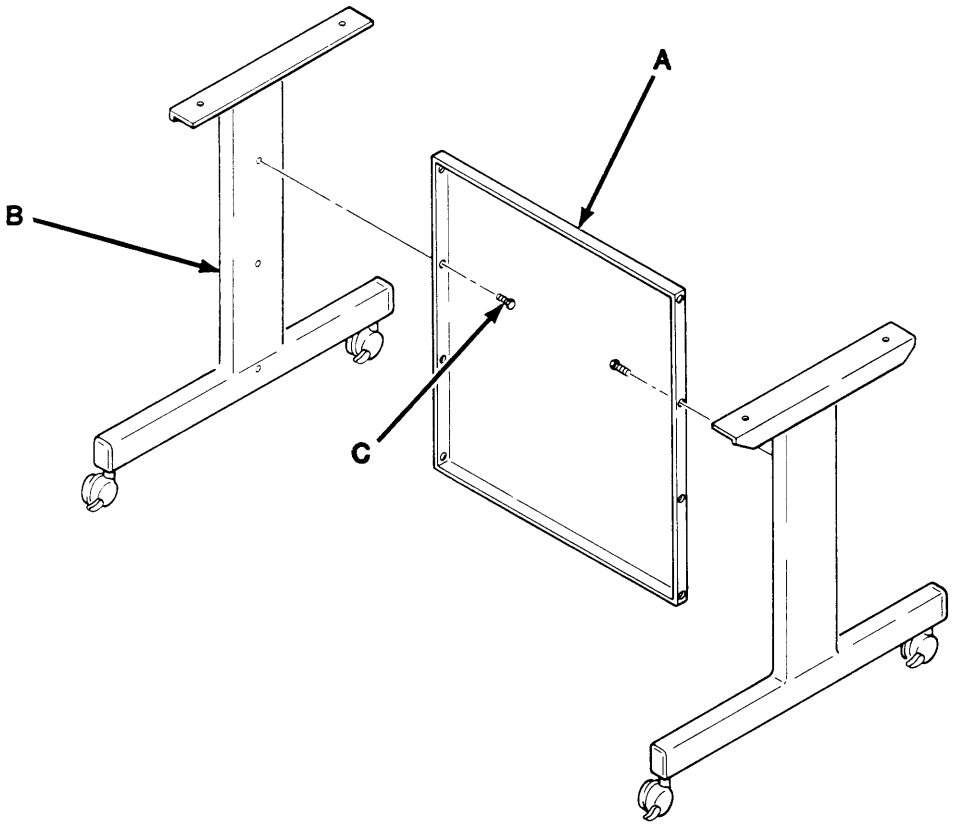


Figure 10−10. Pedestal Legs Installation − Pedestal Model

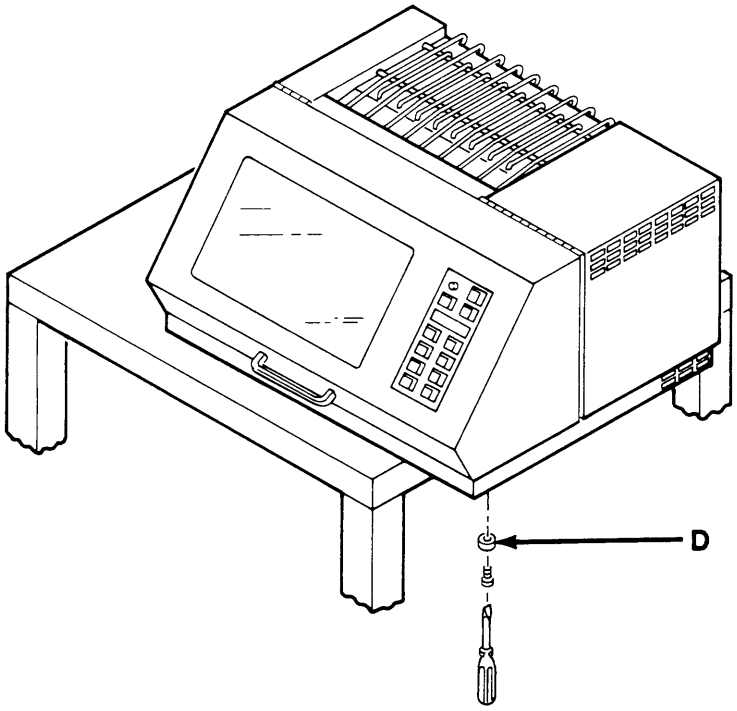


Figure 10−11. Rubber Feet Removal − Pedestal Model

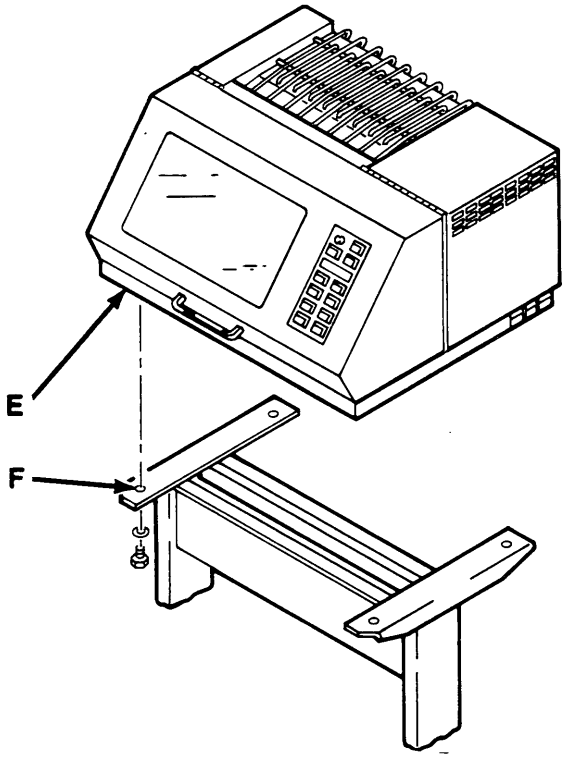


Figure 10−12. Pedestal Mounting − Pedestal Model

Table Top Mounting

Pedestal model printers can be mounted on a sturdy table instead of the pedestal. However, the table must be designed or modified to accommodate the printer paper path and air ventilation requirements. To mount the printer on a table, perform the following instructions.

1. Select a table sturdy enough to support the weight of the printer. If the table is not designed for a bottom feed paper path and air ventilation, modify the table as shown in Figure 10−13.

2. Verify the 4 rubber feet are firmly attached to the base of the printer.

3. Position the printer on the table so that the paper will feed from under the table, through the paper path slot, up into the paper guide of the printer. The paper should pass through the slot with 1/2" clearance at both ends.

4. Position the paper basket (if used) behind the printer. Attach the paper basket ground wire from the paper basket to the printer ac power cord receptacle at the lower right rear corner of the printer.

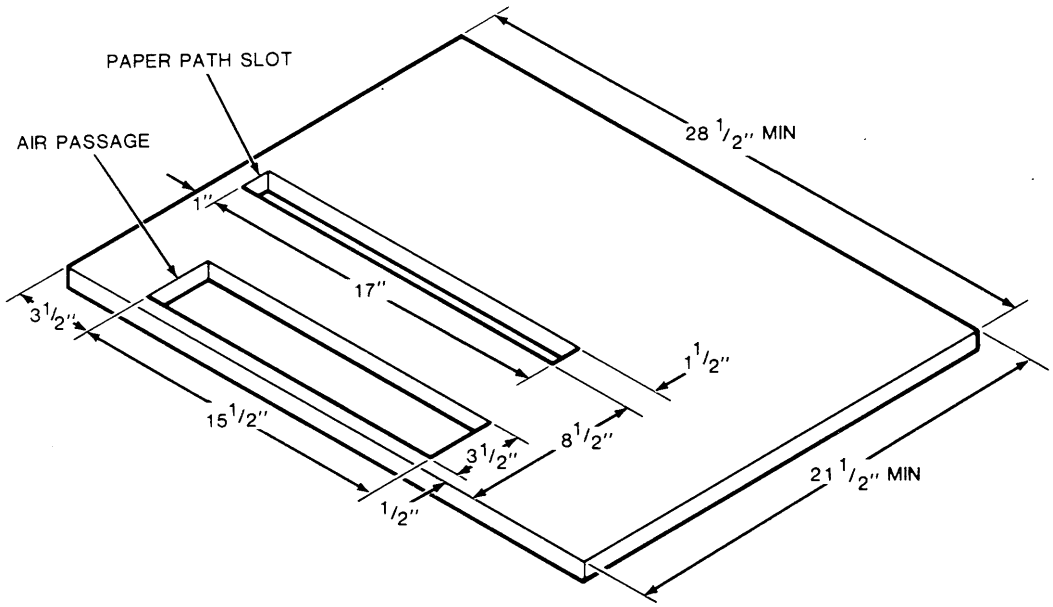


Figure 10−13. Table Top Mounting Specifications − Pedestal Model

Shipping Restraint Removal

The printer shipping restraints must be removed prior to operation. The following tools are required to remove the shipping restraints from a pedestal model:

- 3/32” inch hex wrench
- 3/8” nut driver
- diagonal cutters

❑ WARNING ❑

Do not connect the ac power source before removing the shipping restraints. If the power has been connected, disconnect it prior to performing the shipping restraint removal procedures to prevent possible injury. In addition, the shipping restraints must be installed whenever the printer or shuttle assembly is shipped or transported to prevent damage.

The printer contains 2 platen restraint screws and a foam rubber pad inserted behind the tractor sprockets. Each screw is tagged with a red WARNING label. After mounting the printer on the pedestal or table top, perform the following procedure and refer to Figure 10−14 to remove the shipping restraints. A 3/8” nut driver and a 3/32” hex wrench are required.

1. Raise the printer cover.
2. Rotate the Vertical Position Knob (A) clockwise and pull the rubber pad down and out.
3. Cut and remove the tie wrap securing the Forms Thickness Adjustment Lever (B) on the left side of the printer.
4. Notice the red WARNING label on the restraint screw (C) on the left side of the printer. Using a 3/8” nut driver or wrench, remove the restraint screw from the left side.
5. Notice the red WARNING label on the right side restraint screw (D). Using a 3/32” hex wrench, remove the restraint screw from the right side.
6. Cut and remove the nylon string binding the power cord at the rear of the printer.

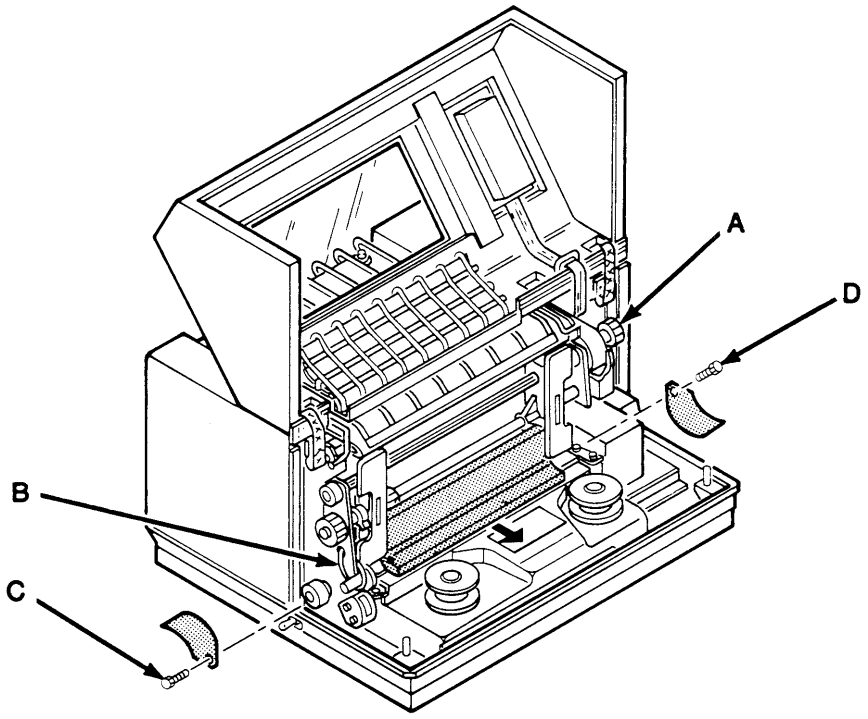


Figure 10−14. Shipping Restraint Removal − Pedestal Model

Cable Connections

Perform the following instructions and refer to Figure 10−15 (floor cabinet model) and Figure 10−16 (pedestal model) to connect the cables to the printer.

1. Verify the voltage shown on the printer ID label (A) is the same as the site line voltage. Refer to the Power Requirements section for more information.

❑ **WARNING** ❑

Operator hazard and printer damage may occur if the printer is connected to a power source for which it is not configured.

2. Make sure the printer power switch (B) is set to OFF.

3. Connect the power cord, which is supplied with the printer, between the printer's ac power connector (C) and the ac line receptacle.

4. Connect the customer supplied interface cable between the printer's interface connector (D) and the host computer. Refer to the Interface chapter for a complete description of the printer interface.

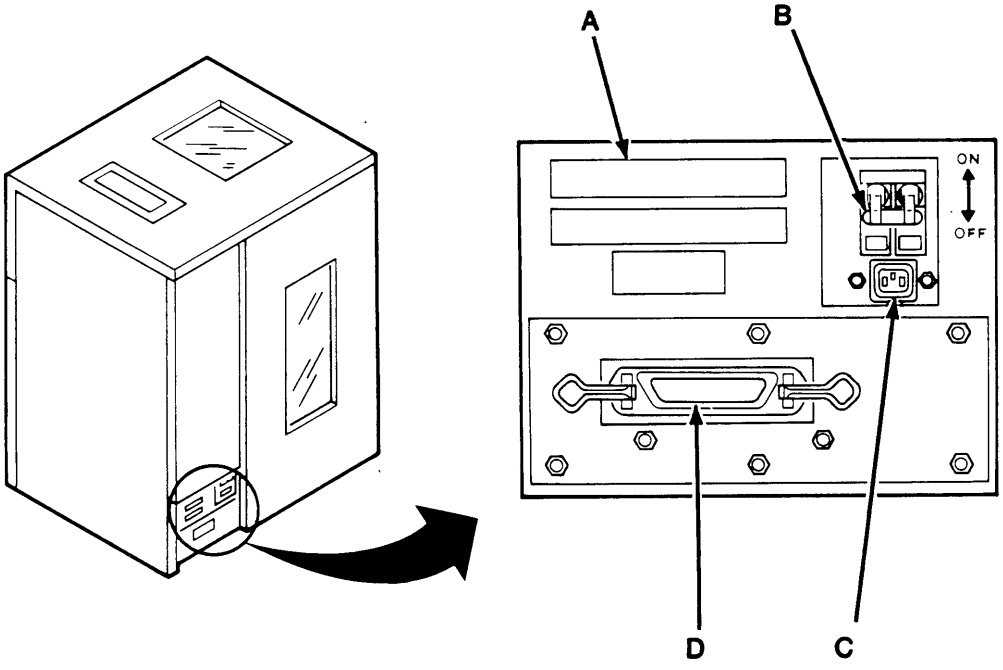


Figure 10−15. Cable Connections − Floor Cabinet Model

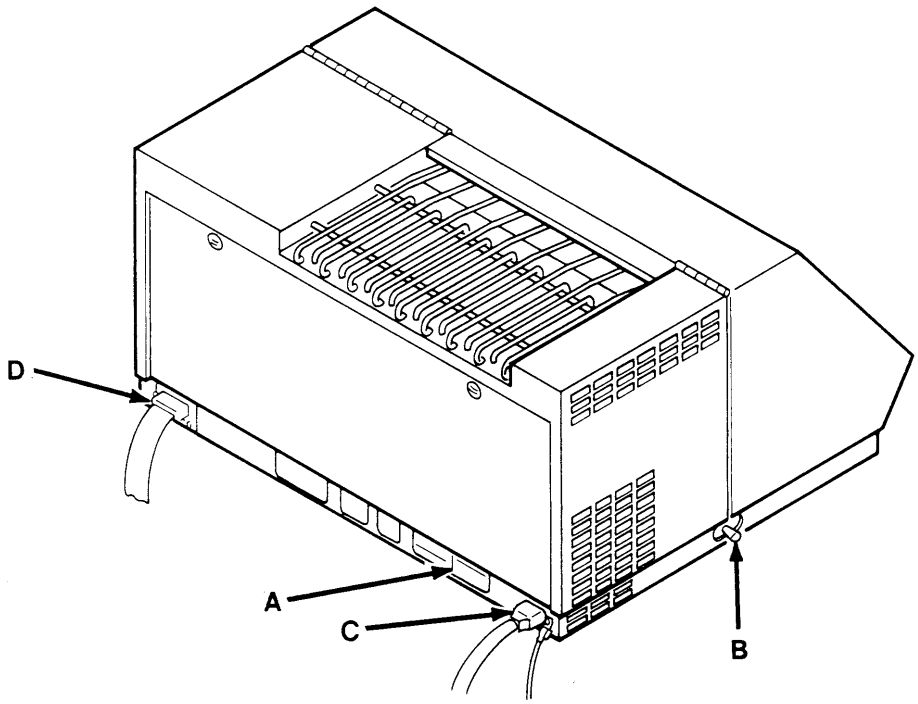


Figure 10−16. Cable Connections − Pedestal Model

Preliminary Test

After installation is complete, the printer is ready for preliminary testing. The following steps define the test procedure. See the Operation chapter for a description of the control panel and message display.

1. Set the ac power switch to ON and verify the POWER indicator is lit.

2. Load full width computer paper and ribbon as described in the Operation chapter.

3. Close the front cover.

4. Press the ON LINE switch until the message display reads OFFLINE READY**.**

5. Press the TOP OF FORM switch. The paper will advance to the next top−of−form (TOF). Refer to the Operation chapter for TOF procedure.

6. Press the CONFIG MENU switch until DIAGNOSTICS appears. Press CONFIG VALUE once; CONFIGURATION PRINTOUT will appear.

   NOTE: Ignore the two CONFIGURATION LOCKED messages briefly displayed. The printer configuration does not have to be unlocked to run self tests.

7. Press the CONFIG MENU switch until the PRINTER TEST FULL WIDTH menu appears.

8. Press the CONFIG VALUE switch. The SHIFT RECYCLE message should appear.

9. Press the RUN/STOP TEST switch. The RUNNING TEST SHIFT RECYCLE message appears. Shifted lines of the alphabet will print across the full width of the paper (132 characters).

10. To stop the test press the RUN/STOP TEST switch once. Press CLEAR FAULT repeatedly to return to off line.

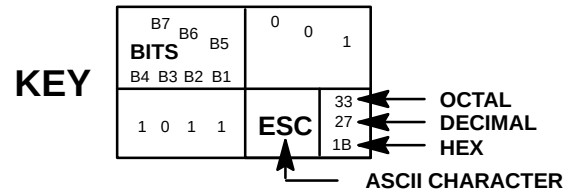
Examine the print quality. Make sure the characters are fully formed and of uniform density. If the test does not run or characters appear malformed, make sure that the forms thickness lever is correctly adjusted for the paper thickness. Call your authorized Service Representative for further assistance.

11. To test the printer to host computer interface, press the ON LINE switch and send several lines of data from the host computer to the printer.

If errors such as wrong characters printed or intermittent paper motion are observed, it may be necessary to install the alternate terminating resistors as described in the Interface chapter. With a Centronics interface, if missing or doubled characters are observed, it may be necessary to change the strobe polarity jumper from E49−E50 to E50−E51. With a RS−232 interface, verify correct operation with a terminal, and re−check the printer configuration. Refer to the Hardware Jumper Configuration section in the Configuration chapter for more information. Call your authorized Service Representative for further assistance.

APPENDIX A

Standard ASCII Character Set and Equivalents



B7 B6 B5 / BITS B4 B3 B2 B1 / ROW	COLUMN 0		1		2		3		4		5		6		7	
0 0 0 0 / 0	NUL	0 0 0	DLE	20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50	`	140 96 60	p	160 112 70
0 0 0 1 / 1	SOH	1 1 1	DC1 (XON)	21 17 11	!	41 33 21	1	61 49 31	A	101 65 41	Q	121 81 51	a	141 97 61	q	161 113 71
0 0 1 0 / 2	STX	2 2 2	DC2	22 18 12	"	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52	b	142 98 62	r	162 114 72
0 0 1 1 / 3	ETX	3 3 3	DC3 (XOFF)	23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	c	143 99 63	s	163 115 73
0 1 0 0 / 4	EOT	4 4 4	DC4	24 20 14	$	44 36 24	4	64 52 34	D	104 68 44	T	124 84 54	d	144 100 64	t	164 116 74
0 1 0 1 / 5	ENQ	5 5 5	NAK	25 21 15	%	45 37 25	5	65 53 35	E	105 69 45	U	125 85 55	e	145 101 65	u	165 117 75
0 1 1 0 / 6	ACK	6 6 6	SYN	26 22 16	&	46 38 26	6	66 54 36	F	106 70 46	V	126 86 56	f	146 102 66	v	166 118 76
0 1 1 1 / 7	BEL	7 7 7	ETB	27 23 17	'	47 39 27	7	67 55 37	G	107 71 47	W	127 87 57	g	147 103 67	w	167 119 77
1 0 0 0 / 8	BS	10 8 8	CAN	30 24 18	(	50 40 28	8	70 56 38	H	110 72 48	X	130 88 58	h	150 104 68	x	170 120 78
1 0 0 1 / 9	HT	11 9 9	EM	31 25 19	)	51 41 29	9	71 57 39	I	111 73 49	Y	131 89 59	i	151 105 69	y	171 121 79
1 0 1 0 / 10	LF	12 10 0 A	SUB	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A	j	152 106 6A	z	172 122 7A
1 0 1 1 / 11	VT	13 11 0 B	ESC	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 4B	[	133 91 5B	k	153 107 6B	{	173 123 7B
1 1 0 0 / 12	FF	14 12 0 C	FS	34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	\	134 92 5C	l	154 108 6C	|	174 124 7C
1 1 0 1 / 13	CR	15 13 0 D	GS	35 29 1D	–	55 45 2D	=	75 61 3D	M	115 77 4D	]	135 93 5D	m	155 109 6D	}	175 125 7D
1 1 1 0 / 14	SO	16 14 0 E	RS	36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	^	136 94 5E	n	156 110 6E	~	176 126 7E
1 1 1 1 / 15	SI	17 15 0 F	US	37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	_	137 95 5F	o	157 111 6F	DEL	177 127 7F

APPENDIX B

Serial Emulation Mode Character Set #1 (80−9F = Control Codes)

0	NUL	32	SP	64	@	96	`	128	NUL	160	á	192	└	224	α
1		33	!	65	A	97	a	129		161	í	193	┴	225	β
2		34	"	66	B	98	b	130		162	ó	194	┬	226	Γ
3		35	#	67	C	99	c	131		163	ú	195	├	227	π
4		36	$	68	D	100	d	132		164	ñ	196	─	228	Σ
5		37	%	69	E	101	e	133		165	Ñ	197	┼	229	σ
6		38	&	70	F	102	f	134		166	ª	198	╞	230	µ
7	BEL	39	'	71	G	103	g	135	BEL	167	º	199	╟	231	τ
8		40	(	72	H	104	h	136		168	¿	200	╚	232	Φ
9	HT	41	)	73	I	105	i	137	HT	169	⌐	201	╔	233	Θ
10	LF	42	*	74	J	106	j	138	LF	170	¬	202	╩	234	Ω
11	VT	43	+	75	K	107	k	139	VT	171	½	203	╦	235	δ
12	FF	44	,	76	L	108	l	140	FF	172	¼	204	╠	236	∞
13	CR	45	-	77	M	109	m	141	CR	173	¡	205	═	237	φ
14	SO	46	.	78	N	110	n	142	SO	174	«	206	╬	238	ε
15	SI	47	/	79	O	111	o	143	SI	175	»	207	╧	239	∩
16		48	0	80	P	112	p	144		176	▒	208	╨	240	≡
17	DC1	49	1	81	Q	113	q	145	DC1	177	▓	209	╤	241	±
18	DC2	50	2	82	R	114	r	146	DC2	178	▉	210	╥	242	≥
19	DC3	51	3	83	S	115	s	147	DC3	179	│	211	╙	243	≤
20	DC4	52	4	84	T	116	t	148	DC4	180	┤	212	╘	244	⌠
21		53	5	85	U	117	u	149		181	╡	213	╒	245	⌡
22		54	6	86	V	118	v	150		182	╢	214	╓	246	÷
23		55	7	87	W	119	w	151		183	╖	215	╫	247	≈
24	CAN	56	8	88	X	120	x	152		184	╕	216	╪	248	°
25		57	9	89	Y	121	y	153		185	╣	217	┘	249	∙
26		58	:	90	Z	122	z	154		186	║	218	┌	250	·
27	ESC	59	;	91	[	123	{	155	ESC	187	╗	219	▉	251	√
28		60	<	92	\	124	¦	156		188	╝	220	▄	252	n
29		61	=	93	]	125	}	157		189	╜	221	▌	253	²
30		62	>	94	^	126	~	158		190	╛	222	▐	254	■
31		63	?	95	_	127	DEL	159		191	┐	223	▀	255	SP

Serial Emulation Mode Character Set #2 (80−9f = Printable Symbols)

0	NUL	32	SP	64	@	96	`	128	Ç	160	á	192	└	224	α
1		33	!	65	A	97	a	129	ü	161	í	193	┴	225	β
2		34	"	66	B	98	b	130	é	162	ó	194	┬	226	Γ
3	♥	35	#	67	C	99	c	131	â	163	ú	195	├	227	π
4	♦	36	$	68	D	100	d	132	ä	164	ñ	196	─	228	Σ
5	♣	37	%	69	E	101	e	133	à	165	Ñ	197	┼	229	σ
6	♠	38	&	70	F	102	f	134	å	166	ª	198	╞	230	µ
7	BEL	39	'	71	G	103	g	135	ç	167	º	199	╟	231	τ
8		40	(	72	H	104	h	136	ê	168	¿	200	╚	232	Φ
9	HT	41	)	73	I	105	i	137	ë	169	⌐	201	╔	233	Θ
10	LF	42	*	74	J	106	j	138	è	170	¬	202	╩	234	Ω
11	VT	43	+	75	K	107	k	139	ï	171	½	203	╦	235	δ
12	FF	44	,	76	L	108	l	140	î	172	¼	204	╠	236	∞
13	CR	45	-	77	M	109	m	141	ì	173	¡	205	═	237	φ
14	SO	46	.	78	N	110	n	142	Ä	174	«	206	╬	238	ε
15	SI	47	/	79	O	111	o	143	Å	175	»	207	╧	239	∩
16		48	0	80	P	112	p	144	É	176	▒	208	╨	240	≡
17	DC1	49	1	81	Q	113	q	145	æ	177	▓	209	╤	241	±
18	DC2	50	2	82	R	114	r	146	Æ	178	▌	210	╥	242	≥
19	DC3	51	3	83	S	115	s	147	ô	179	│	211	╙	243	≤
20	DC4	52	4	84	T	116	t	148	ö	180	┤	212	╘	244	⌠
21	§	53	5	85	U	117	u	149	ò	181	╡	213	╒	245	⌡
22		54	6	86	V	118	v	150	û	182	╢	214	╓	246	÷
23		55	7	87	W	119	w	151	ù	183	╖	215	╫	247	≈
24	CAN	56	8	88	X	120	x	152	ÿ	184	╕	216	╪	248	°
25		57	9	89	Y	121	y	153	Ö	185	╣	217	┘	249	∙
26		58	:	90	Z	122	z	154	Ü	186	║	218	┌	250	·
27	ESC	59	;	91	[	123	{	155	¢	187	╗	219	█	251	√
28		60	<	92	\	124	¦	156	£	188	╝	220	▄	252	ⁿ
29		61	=	93	]	125	}	157	¥	189	╜	221	▌	253	²
30		62	>	94	^	126	~	158	₧	190	╛	222	▐	254	■
31		63	?	95	_	127	DEL	159	ƒ	191	┐	223	▀	255	SP

P−Series Mode Character Set #1 (80−9f = Control Codes)

0	NUL	32	SP	64	@	96	`	128	NUL	160	á	192	└	224	α
1	SOH	33	!	65	A	97	a	129	SOH	161	í	193	┴	225	β
2		34	"	66	B	98	b	130		162	ó	194	┬	226	Γ
3		35	#	67	C	99	c	131		163	ú	195	├	227	π
4	EOT	36	$	68	D	100	d	132	EOT	164	ñ	196	─	228	Σ
5	ENQ	37	%	69	E	101	e	133	ENQ	165	Ñ	197	┼	229	σ
6	ACK	38	&	70	F	102	f	134	ACK	166	ª	198	╞	230	µ
7	BEL	39	'	71	G	103	g	135	BEL	167	º	199	╟	231	τ
8	BS	40	(	72	H	104	h	136	BS	168	¿	200	╚	232	Φ
9		41	)	73	I	105	i	137		169	⌐	201	╔	233	Θ
10	LF	42	*	74	J	106	j	138	LF	170	¬	202	╩	234	Ω
11	VT	43	+	75	K	107	k	139	VT	171	½	203	╦	235	δ
12	FF	44	,	76	L	108	l	140	FF	172	¼	204	╠	236	∞
13	CR	45	-	77	M	109	m	141	CR	173	¡	205	═	237	ϕ
14	SO	46	.	78	N	110	n	142	SO	174	«	206	╬	238	ε
15	SI	47	/	79	O	111	o	143	SI	175	»	207	╧	239	∩
16	DLE	48	0	80	P	112	p	144	DLE	176	▒	208	╨	240	≡
17	DC1	49	1	81	Q	113	q	145	DC1	177	▓	209	╤	241	±
18	DC2	50	2	82	R	114	r	146	DC2	178	▉	210	╥	242	≥
19	DC3	51	3	83	S	115	s	147	DC3	179	▏	211	╙	243	≤
20	DC4	52	4	84	T	116	t	148	DC4	180	┤	212	╘	244	⌠
21	NAK	53	5	85	U	117	u	149	NAK	181	╡	213	╒	245	⌡
22	SYN	54	6	86	V	118	v	150	SYN	182	╢	214	╓	246	÷
23	ETB	55	7	87	W	119	w	151	ETB	183	╖	215	╫	247	≈
24	CAN	56	8	88	X	120	x	152	CAN	184	╕	216	╪	248	°
25	EM	57	9	89	Y	121	y	153	EM	185	╣	217	┘	249	∙
26	SUB	58	:	90	Z	122	z	154	SUB	186	▌	218	┌	250	·
27	ESC	59	;	91	[	123	{	155	ESC	187	╗	219	▉	251	√
28	FS	60	<	92	\	124	¦	156	FS	188	╝	220	▄	252	ⁿ
29	GS	61	=	93	]	125	}	157	GS	189	╜	221	▌	253	²
30	RS	62	>	94	^	126	~	158	RS	190	╛	222	▐	254	■
31	US	63	?	95	_	127	SP	159	US	191	┐	223	▀	255	SP

P−Series Mode Character Set #2 (80−9f = Printable Symbols)

0	NUL	32	SP	64	@	96	`	128	Ç	160	á	192	└	224	α
1	SOH	33	!	65	A	97	a	129	ü	161	í	193	┴	225	β
2		34	"	66	B	98	b	130	é	162	ó	194	┬	226	Γ
3		35	#	67	C	99	c	131	â	163	ú	195	├	227	π
4	EOT	36	$	68	D	100	d	132	ä	164	ñ	196	─	228	Σ
5	ENQ	37	%	69	E	101	e	133	à	165	Ñ	197	┼	229	σ
6	ACK	38	&	70	F	102	f	134	å	166	ª	198	╞	230	µ
7	BEL	39	'	71	G	103	g	135	ç	167	º	199	╟	231	τ
8	BS	40	(	72	H	104	h	136	ê	168	¿	200	╚	232	Φ
9		41	)	73	I	105	i	137	ë	169	⌐	201	╔	233	Θ
10	LF	42	*	74	J	106	j	138	è	170	¬	202	╩	234	Ω
11	VT	43	+	75	K	107	k	139	ï	171	½	203	╦	235	δ
12	FF	44	,	76	L	108	l	140	î	172	¼	204	╠	236	∞
13	CR	45	-	77	M	109	m	141	ì	173	¡	205	═	237	φ
14	SO	46	.	78	N	110	n	142	Ä	174	«	206	╬	238	ε
15	SI	47	/	79	O	111	o	143	Å	175	»	207	╧	239	∩
16	DLE	48	0	80	P	112	p	144	É	176	⁞	208	╨	240	≡
17	DC1	49	1	81	Q	113	q	145	æ	177	⁞	209	╤	241	±
18	DC2	50	2	82	R	114	r	146	Æ	178	▓	210	╥	242	≥
19	DC3	51	3	83	S	115	s	147	ô	179	⁞	211	╙	243	≤
20	DC4	52	4	84	T	116	t	148	ö	180	┤	212	╘	244	⌠
21	NAK	53	5	85	U	117	u	149	ò	181	╡	213	╒	245	⌡
22	SYN	54	6	86	V	118	v	150	û	182	╢	214	╓	246	÷
23	ETB	55	7	87	W	119	w	151	ù	183	╖	215	╫	247	≈
24	CAN	56	8	88	X	120	x	152	ÿ	184	╕	216	╪	248	°
25	EM	57	9	89	Y	121	y	153	Ö	185	╣	217	┘	249	∙
26	SUB	58	:	90	Z	122	z	154	Ü	186	⁞	218	┌	250	·
27	ESC	59	;	91	[	123	{	155	ø	187	╗	219	▉	251	√
28	FS	60	<	92	\	124	¦	156	£	188	╝	220	▄	252	ⁿ
29	GS	61	=	93	]	125	}	157	¥	189	╜	221	▌	253	²
30	RS	62	>	94	^	126	~	158	₧	190	╛	222	▐	254	■
31	US	63	?	95	_	127	SP	159	ƒ	191	┐	223	▀	255	SP

International Characters

French

ASCII code	64	91	92	93	123	124	125	126
print symbol	à	°	ç	§	é	ù	è	¨

German

ASCII code	64	91	92	93	123	124	125	126
print symbol	§	Ä	ö	Ü	ä	ö	ü	ß

English

ASCII code	35
print symbol	£

Danish

ASCII code	91	92	93	123	124	125
print symbol	Æ	Ø	Å	æ	ø	å

Swedish

ASCII code	36	64	91	92	93	94	96	123	124	125	126
print symbol	¤	É	Ä	ö	Å	Ü	é	ä	ö	å	ü

Italian

ASCII code	91	93	96	123	124	125	126
print symbol	°	é	ù	à	ò	è	ì

Spanish

ASCII code	35	91	92	93	123	124
print symbol	₧	¡	Ñ	¿	¨	ñ

Japanese

ASCII code	92
print symbol	¥

French Canadian

ASCII code	64	91	92	93	94	96	123	124	125	126
print symbol	à	â	ç	ê	î	ô	é	ù	è	û

APPENDIX C

Specifications

Appendix Table C−1 lists physical and electrical specifications for P6000L/P6200L Series printers.

Table C−1. P6000L/P6200L Series Printer Specifications

400 LPM Models: P6040L, P6240L
800 LPM Models: P6080L, P6280L

PERFORMANCE

	UPPERCASE ONLY		UPPERCASE/ LOWERCASE		PLOT RATE	
	400 (lpm)	800	400 (lpm)	800	400 (ipm)	800
Correspondence (Near Letter Quality, NLQ)	89	177	77	154	8.3	16.6
Data Processing	300	600	240	480	33.3	66.7
High Speed	400	800	342	685	50	100

PRINT APPLICATION	CHAR. PITCH (CPI)	HORZ DOTS (ON CHAR. PER LINE	DOT DENSITY (DPI) DOT CENTERS) X VERT DOTS	DOT MATRIX HORZ DOTS (ON DOT CENTERS) X VERT DOTS + DESCENDERS
Correspondence Quality	10	132	120(120)x144	9(9)x13+2
	12	158		7(7)x13+2
	13.3	176		7(7)x13+2
	15	198		5(5)x13+2
	17	226		4(5)x13+2
Data Processing	10	132	60(120)x72	5(9)x7+2
	12	158		4(7)x7+2
	13.3	176		4(7)x7+2
	15	198		3(5)x7+2
	17.14	226		3(5)x7+2
High Speed	10	132	60(120)x48	5(9)x5+1
	12	158		4(7)x5+1
	13.3	176		4(7)x5+1

Table C−1. P6000L/P6200L Series Printer Specifications (Continued)

CHARACTERISTIC	SPECIFICATION	
Character Sets:		
ASCII Standard	96 characters − Normal and Correspondence Modes	
ASCII Extended	64 characters − Normal and Correspondence Modes 64 characters − High Speed Mode	
Maximum (Standard and Extended)	144 characters per Print Mode	
International:	French German UK Danish Swedish Italian Spanish Japan French Canadian	
Temperature:		
Operating	5 to 40°C	
Storage	− 40 to 70°C	
Relative Humidity:		
Operating	10% to 90% (noncondensing)	
Storage	5% to 95% (noncondensing)	
Acoustic Noise:	Generated noise is less than 55 dBA.	
Dimensions:	Floor Model	Pedestal Model
Height	41.7 inches	16.5 inches
Width	34.0 inches	30.0 inches
Depth	28.55 inches	24.25 inches
Weight	380 pounds	185 pounds
Interface:		
Type	Resident parallel and serial	
Logic Levels	TTL, RS−232	
Data Format	ASCII	
Compatibility	Centronics, Dataproducts, RS−232	
Buffer Size	512, 1024, or 2048	

Table C−1. P6000L/P6200L Series Printer Specifications (Continued)

CHARACTERISTIC	SPECIFICATION	
Maximum Data Input Rate:		
Dataproducts	300,000 characters per second	
Centronics	200,000 characters per second	
RS−232	Selectable BAUD rate or external clock	
Input Power:		
Voltage	120 or 240	
Phase	Single	
Frequency	50 or 60 Hz	
Power Consumption	P6040L/P6240L	P6080L/P6280L
Nominal Standby	220 W	162 W
Nominal Operating	480 W	500 W
Motor Start−up Current	14.2 A 25.4 A	
Ribbon:		
Standard	Printronix P/N 102247	
Carbon Black	P/N 102796 OCR Nylon fabric 1−inch by 60 yards spool to spool; metal reverses on each end.	
Paper Type	Edge−punched, fanfold, 3− to 16− inches wide.	
Paper Thickness:		
Single−part	20 to 100 pound stock	
Multi−part	One to 6−part forms	
Sheet Thickness	0.025 inches maximum	
Paper Drive	Adjustable tractors (8 pin engagement)	

NOTE: Only use ribbons that meet the stated specifications.

Table C−1. P6000L/P6200L Series Printer Specifications (Continued)

CHARACTERISTIC	SPECIFICATION	
Labels on Backing:	One−part continuous perforated fanfold back form. Labels must be placed at least 1/6 inch from the fanfold perforation. Backing adhesive must not be squeezed out during printing.	
Sheet Size	3− to 16−inches wide including the two standard perforated tractor feed strips. 3− to 24−inches long between top and bottom perforations.	
Thickness	Not to exceed 0.025−inch including the backing sheet.	
Forms Control:		
Perforation Skip−Over	1, 1/2, 2/3, 5/6 inch Control Panel Selectable	
Vertical Format Unit	Programmable EVFU and DAVFU	
Drive Speed:	P6040L/P6240L	P6080L/P6280L
Slew (inches per second)	8 ips	16 ips

APPENDIX D

Control Code Cross Reference

The following lists present the programming control codes alphabetically by function and alphabetically by code. In the Programming chapter, an alphabetical list of control code functions is presented with more detailed information on each control code.

Alphabetical by Function

Function	P−Series	Serial	Page
Backspace	N/A	BS	6−5
Bell	BEL	BEL	6−6
Bit Image Mode, Double Density	N/A	ESC L	6−8
Bit Image Mode, Dbl Density Dbl Speed	N/A	ESC Y	6−9
Bit Image Mode, Quadruple Density	N/A	ESC Z	6−10
Bit Image Mode, Single Density	N/A	ESC K	6−7
Bold Print	SOH G	ESC G	6−11
Bold Print Reset	SOH H	ESC H	6−12
Cancel	N/A	CAN	6−13
Carriage Return	CR	CR	6−14
Character Set Select (Control Codes)	SOH 7	ESC 7	6−15
Character Set Select (Printable Symbols)	SOH 6	ESC 6	6−16
Condensed Print	N/A†	ESC SI	6−17
Condensed Print Reset	N/A†	DC2	6−18
Elongated (Double High) Print	SOH d (or BS)	ESC d	6−19
Emphasized Print	SOH E	ESC E	6−20
Emphasized Print Reset	SOH F	ESC F	6−21
Even Dot Plot	EOT	N/A	6−43
EVFU Commands (P−Series)	DLE−US	N/A	6−22
Expanded (Double Wide) Print	SOH W	ESC W	6−23
Expanded (Dbl Wide) Print, One Line	N/A	SO	6−24
Extended Character Set	SO	ESC 4	6−25
Extended Character Set Cancel	SI	ESC 5	6−26
Form Feed	FF	FF	6−27
Forms Length Set (Inches)	N/A†	ESC C 0	6−28
Forms Length Set (Lines)	N/A†	ESC C	6−29
Horizontal Tab	HT	HT	6−30
Horizontal Tab Set	SOH D	ESC D	6−31
International Character Select	SOH R	ESC R	6−32
Line Feed	LF	LF	6−33
Line Feed n/216 Inch	N/A	ESC J	6−34
Line Spacing 1/6 Inch (6 lpi)	SOH 2	ESC 2	6−35
Line Spacing 1/8 Inch (8 lpi)	SOH 0	ESC 0	6−36
Line Spacing 8 LPI (1 line only)	ACK	N/A †	6−37
Line Spacing 7/72 Inch	N/A	ESC 1	6−38

†NOTE: These functions are available using another control code sequence or control panel selections.

Alphabetical by Function (Continued)

Function	P−Series	Serial	Page
Line Spacing n/72 Inch (asserted) (as stored by ESC A)	N/A	ESC 2	6−39
Line Spacing n/72 Inch (stored) (as asserted by ESC 2)	N/A	ESC A	6−40
Line Spacing n/216 Inch	N/A	ESC 3	6−41
Odd Dot Plot	ENQ	N/A	6−44
Overscoring	SOH _	ESC _	6−42
Plot, Even Dot (P−Series High Density)	EOT	EOT	6−43
Plot, Odd Dot (P−Series Normal Density)	ENQ	ENQ	6−44
Printer Deselect	N/A	DC3	6−45
Printer Reset	SOH @	ESC @	6−46
Printer Select	N/A	DC1	6−47
Print Mode/Pitch Selection	SOH X	ESC X	6−48
RibbonMinder	SOH r	ESC r	6−49
RibbonMinder (through page)			6−51
Skip−Over Perforation	N/A†	ESC N	6−52
Skip−Over Perforation Cancel	N/A†	ESC O	6−53
Superscript/Subscript Printing	SOH S	ESC S	6−54
Superscript/Subscript Printing Reset	SOH T	ESC T	6−55
Underline	SOH −	ESC −	6−56
Vertical Tab	VT	VT	6−57
Vertical Tab Set (Serial Matrix)	N/A	ESC B	6−58

†NOTE: These functions are available using another control code sequence or control panel selections.

Alphabetical by P−Series Code

P−Series Code	Function	Page
ACK	8 LPI (one line only)	6−37
BEL	Bell	6−6
BS	Elongated (Double High) Print (one line only)	6−19
CR	Carriage Return	6−14
DLE−US	EVFU Commands	6−22
ENQ	Odd Dot Plot	6−44
EOT	Even Dot Plot	6−43
FF	Form Feed	6−27
LF	Line Feed	6−33
SI	Extended Character Set Cancel	6−26
SO	Extended Character Set Select	6−25
SOH @	Reset	6−46
SOH −	Underline	6−56
SOH _	Overscoring	6−42
SOH 0	Line Spacing 1/8 Inch (8 lpi)	6−36
SOH 2	Line Spacing 1/6 Inch (6 lpi)	6−35

SOH 6	Character Set Select (Printable Symbols)	6−16

Alphabetical by P−Series Code (Continued)

P−Series Code	Function	Page
SOH 7	Character Set Select (Control Codes)	6−15
SOH d (or BS)	Elongated (Double High) Print (one line only)	6−19
SOH E	Emphasized Print	6−20
SOH F	Emphasized Print Reset	6−21
SOH G	Bold Print	6−11
SOH H	Bold Print Reset	6−12
SOH r	RibbonMinder	6−49 − 6−51
SOH R	International Character Set	6−32
SOH S	Superscript/Subscript Printing	6−54
SOH T	Superscript/Subscript Printing Reset	6−55
SOH W	Expanded (Double Wide) Print	6−23
SOH X	Print Mode/Pitch Select	6−48
VT	Vertical Tab	6−57

Alphabetical by Serial Code

Serial Code	Function	Page
BEL	Bell	6−6
BS	Backspace	6−5
CAN	Cancel	6−13
CR	Carriage Return	6−14
DC1	Printer Select	6−47
DC2	Condensed Print Reset	6−18
DC3	Printer Deselect	6−45
ENQ	Odd Dot Plot	6−44
EOT	Even Dot Plot	6−43
FF	Form Feed	6−27
HT	Horizontal Tab	6−30
LF	Line Feed	6−33
SI	Condensed Print	6−17
SO	Expanded (Double Wide) Print, One Line	6−24
VT	Vertical Tab	6−57
ESC @	Reset	6−46
ESC −	Underline	6−56
ESC _	Overscoring	6−42
ESC 0	Line Spacing 1/8 Inch (8 lpi)	6−36
ESC 1	Line Spacing 7/72 Inch	6−38
ESC 2	Line Spacing 1/6 Inch (6 lpi)	6−39
ESC 3	Line Spacing n/216 Inch	6−41
ESC 4	Extended Character Set Select	6−25
ESC 5	Extended Character Set Cancel	6−26
ESC 6	Character Set Select (Printable Symbols)	6−16
ESC 7	Character Set Select (Control Codes)	6−15
ESC d	Elongated (Double High) Print	6−19
ESC r	RibbonMinder	6−49 − 6−51

ESC A	Line Spacing n/72 Inch	6−40
ESC B	Vertical Tab Set	6−58

Alphabetical by Serial Code (Continued)

Serial Code	Function	Page
ESC C	Forms Length Set (Lines)	6−29
ESC C NUL	Forms Length Set (Inches)	6−28
ESC D	Horizontal Tab Set	6−31
ESC E	Shadow (Emphasized) Print	6−20
ESC F	Shadow (Emphasized) Print Reset	6−21
ESC G	Bold Print	6−11
ESC H	Bold Print Reset	6−12
ESC J	Line Feed n/216 Inch	6−34
ESC K	Bit Image Mode, Single Density	6−7
ESC L	Bit Image Mode, Double Density	6−8
ESC N	Skip−Over Perforation	6−52
ESC O	Skip−Over Perforation Cancel	6−53
ESC R	International Character Set	6−32
ESC S	Superscript/Subscript Printing	6−54
ESC T	Superscript/Subscript Printing Reset	6−55
ESC W	Expanded (Double Wide) Print	6−23
ESC X	Print Mode/Pitch Select	6−48
ESC Y	Bit Image Mode, Dbl Density, Dbl Speed	6−9
ESC Z	Bit Image Mode, Quadruple Density	6−10

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